The Electrical Industry's Weekly Magazine

September 23, 1957

# Electrical World

Price 50 Cents

A McGraw-Hill Publication

## Commercial Cooking:

## A 'Sleeping Giant' Potentially Worth 40 Billion Kwhr

...Page 81

Summer Peaks Top 1956... Page 66

Pumped-Storage Hydro Attractive... Page 7

E B POWER
UNIVERSITY MICROFILMS INC
313 N 1 ST
ANN ARBOR MICH

**TRANSIENT NETWORK ANALYZER** supplies data for a joint G.E.—American Gas & Electric Co. study of transmission tower lightning flashovers on a 345-kv line. L. to r., W. S. Price, AG&E Service Corp., G.E.'s J. G. Anderson, High Voltage Lab., and W. F. Skeats, Switchgear Development Laboratory.

# How General Electric is helping 50 utilities conserve engineering manhours this year

By providing computational equipment and associated engineering assistance, General Electric is helping approximately 50 electric utilities solve individual system problems during 1957. Thus, these utilities—representing over one-third of the nation's generating capacity—are accomplishing more per engineering manhour.

This service originated over 40 years ago, when General Electric first offered a d-c network analyzer—the forerunner of modern system-analyzing equipment—for utility use. Since then, General Electric has led in the development of analytical tools and techniques for investigating utility systems.

Through the years, the growing facilities in Schenectady have been applied to study virtually every type of utility problem. As a vital aid to utilities in setting up such studies, General Electric offers the services of experienced analytical, application, and development engineers from headquarters, district offices, and laboratories throughout the Company.

Since General Electric also uses these computational tools to further improvements in basic system engineering concepts, the entire electric utility industry benefits from their use. For more information on how these General Electric facilities can help save engineering manhours for you, contact your local General Electric Apparatus Sales Office. General Electric Company, Section 301-362, Schenectady 5, N. Y.

*MORE POWER TO AMERICA*

GENERAL ELECTRIC

**A-C NETWORK ANALYZER** helps Florida Power Corp. determine future construction requirements for its system. L. to r., M. F. Hebb, Florida Power Corp., G.E.'s J. C. Hartley, Atlanta Application Engrg., and R. D. Wood, Analytical Engrg.

**ELECTRONIC COMPUTER** quickly solves utility power loss problem conducted by G.E.'s A. J. Glimn (center), Analytical Engrg., and Ruth E. Callaghan and H. N. Cantrell, Large Steam Turbine-Generator Engrg. Calculations Center.

**ELECTRONIC DIFFERENTIAL ANALYZER** is employed by F. S. Rothe (left), Analytical Engrg., and M. Temoshok, Engrg. Planning and Development, to calculate data leading to improved excitation systems in generators for utilities.

# Electrical World

Vol. 148, No. 13 September 23, 1957

Published for 83 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

## Features

CURRENT EVENTS

### 1957 Summer Peaks Rise 7%

Upward trend continues despite relatively cool weather. Most companies say peaks came early.....p 66

### How Reactor Regulations Are Evolving

One year after first public hearings, construction permits are no longer marked "classified".....p 68

GENERATION

### Pumped Storage Hydro Is Attractive

Lower overall costs, along with flexibility make it desirable where suitable site is available.....p 73

INDUSTRIAL

### Coordinated Relaying Protects Processing

Pilot wire and differential relays guard power from single source for high reliability.....p 78

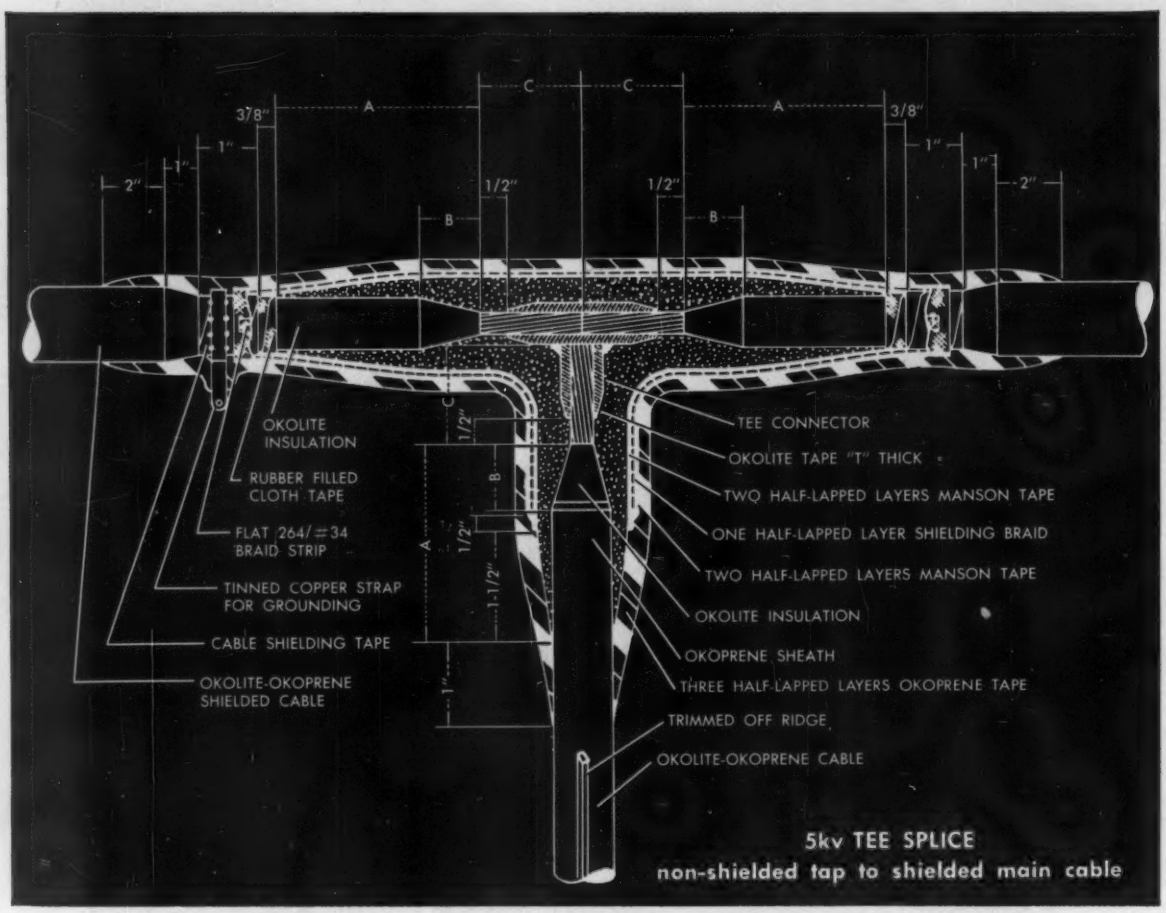
## Special Report

### Third Commercial Electric Cooking Survey

Shows utilities pushing harder to wake "sleeping giant." Average load additions climb 27%.....p 81

## Departments

Atomic Progress ..... 68
Editorials ..... 65
• Electrical Newsletter ..... 21
Engineering Reference Sheet.... 96
Engineering Trends ..... 24
From the Publisher..... 5
Heating & Cooling.....102
Statistics .....120
How To ..... 91
• Management Newsletter .....119
Manufacturers and Markets.....125
Meetings Calendar .....134
New Equipment .....111
News About People.....130
Selling ..... 98
INDEX TO ADVERTISERS.....139




# The "simple" tee splice . . .

The simple tee splice . . . is really not so simple. A glance at the splice diagram above certainly shows this. Don't gamble with the dependability of your cable system by neglecting its splicing or terminating. Use the correct splicing methods and the best materials available to insure the safety of the system.

Complete splicing and terminating diagrams, like the one above, along with step-by-step instructions covering rubber-insulated cables up to 5000 volts are available in Okonite Bulletin EW-1085. These splicing instructions are a result of Okonite insulation research—the same research that has developed the industry's best-known splicing materials . . . Manson friction tape, Okonite rubber tape, Okolite high voltage rubber tape, and Okoprene weather-resistant neoprene tape. For full details, contact your distributor or The Okonite Company, Passaic, N. J.

***Available through authorized distributors only***

**OKONITE**

**splicing tapes**

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## . . . from the publisher

# So You Want to Be a Boss?

Much has been said of late about what it takes to be a good boss.

American Management Association recently even went so far as to survey the personal likes and worries of the "typical" company president. (He likes Scotch and golf, worries about his patience and tact.)

A couple of weeks ago Electrical World itself reported on "What Makes a Good Manager" (EW Sept. 9, p 52). One standout conclusion: The better manager decides and acts faster than his colleagues.

Fast decisions require a grasp of the facts. But where do you get the facts? One answer is supplied by Idaho Power Co's Personnel Director, R. H. "Bob" Sessions, who writes:

"The more extensive an employee's knowledge of what has been done in the past, the greater will be his power of knowing what to do in the future. Purposeful reading, day by day, is the employee's most comprehensive method of stockpiling this desired knowledge . . . To make a noticeable contribution to the utility industry today requires up-to-date specialized knowledge and lots of it."

And as another figure in industry puts it: "The man who can find a method of making an executive as proud of his reading score as he is of his golf score will be worth a couple of billion dollars to American industry."

Fischer Black


**ELECTRICAL WORLD**

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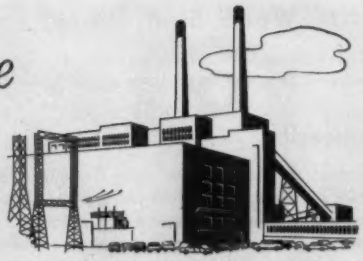
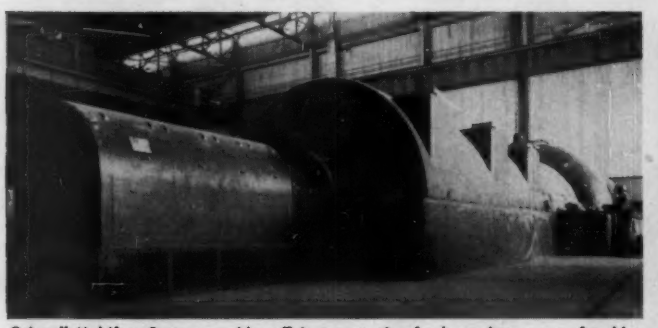
# Grinnell provides *complete fire protection* for vital areas at Detroit Edison Company

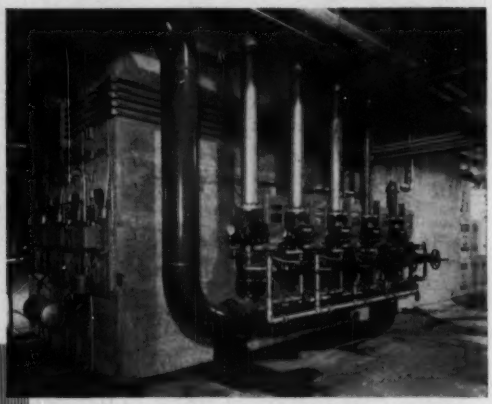


Pictures below taken at River Rouge Power Plant of Detroit Edison Company.

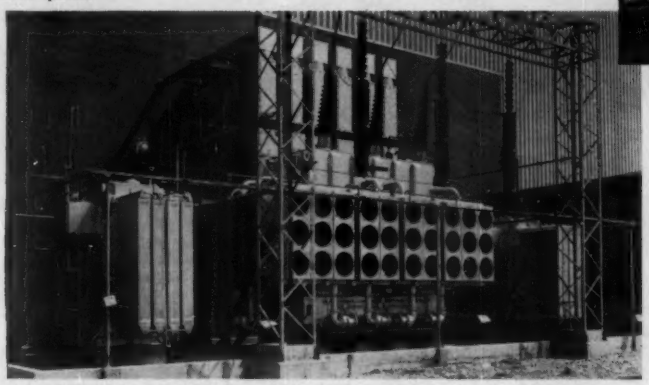
## GRINNELL MULSIFYRE SYSTEM FOR EXTINGUISHING OIL FIRES



Grinnell Mulsifyre System provides efficient protection for hazardous areas of turbine lubrication system.



Automatic control valves for various fire protection systems throughout station.

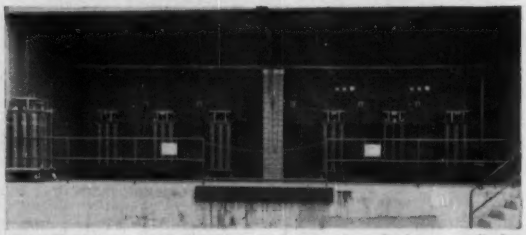


Around-the-clock protection for world's largest capacity (315,000 kva) generator transformer provided by Grinnell Mulsifyre System.

Complete extinguishment of fires within areas protected by Grinnell Mulsifyre is usually obtained in a matter of seconds after water discharge starts. Case histories prove that Mulsifyre projectors are effective wherever the danger of fire in medium or heavy oils can be limited to a definite area. In these oils the surface emulsion remains to give after-protection against flashback. Detailed information on Grinnell Mulsifyre will be sent on request.

## GRINNELL PROTECTOSPRAY FOR COOLING AGAINST FIRE EXPOSURE

Flammable gases having wide explosive limits require protection against input heat when stored under pressure to prevent bursting of the containers. Hydrogen gas, with explosive limts of 4 to 75 percent when mixed with air, requires protective cooling whenever and wherever its container faces the danger of exposure to possible fire or heat from fire.



Grinnell ProtectoSpray System stands guard at hydrogen cylinder storage dock.

**GRINNELL** WHENEVER FIRE PROTECTION IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Branch offices in Principal Cities

# picture of a man on his way UP

## *with tools and equipment from*

# Graybar

When you equip your linemen with the best tools you can buy, you utilize the full experience and skill of your men. And when you order linemen's tools and equipment from Graybar you have, at your disposal, the facilities of the largest single source of "Everything Electrical" in the world. Call your nearest Graybar office for every tool used from the bottom of the hole to the top of the pole.

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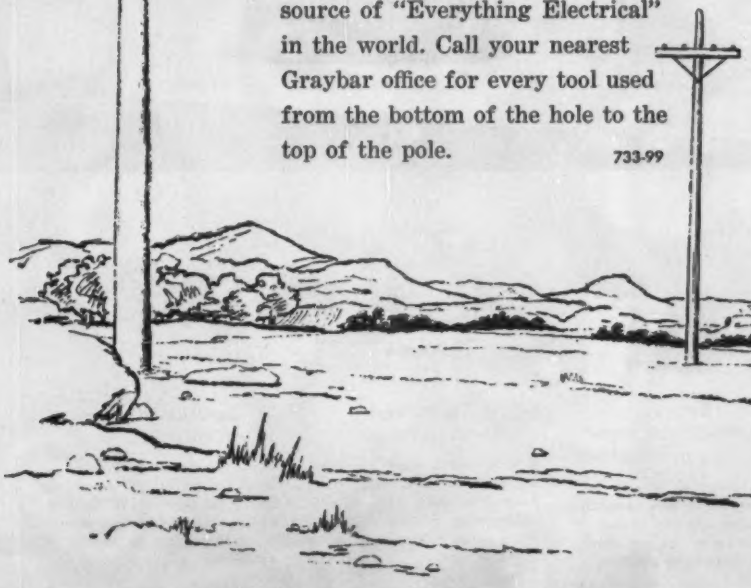


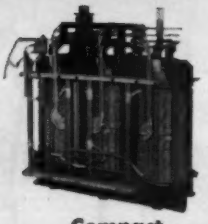
*Call Graybar first for...*

*Everything Electrical*

GRAYBAR ELECTRIC COMPANY, INC.
420 Lexington Avenue, New York 17, N. Y.

IN OVER 130 PRINCIPAL CITIES

# Helping

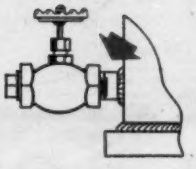


**Compact, low-loss design**

Thermal capacities are high for contingency load conditions. Sturdy, time-proved core and coil construction adequately meets repeated short-circuit stresses of network operation.

**Safe, dependable tap-changing mechanism**

Handle inserted through two-inch opening in cover operates mechanism. Handle cannot be removed unless the tap changer is in a positive position.



**Threaded valve connections**

Connections are solder wiped for extra protection. Valves located for easy access. Globe-type valves with non-rotating seats close tight, avoid wear on valve seats.

**Special design of bushing seal**

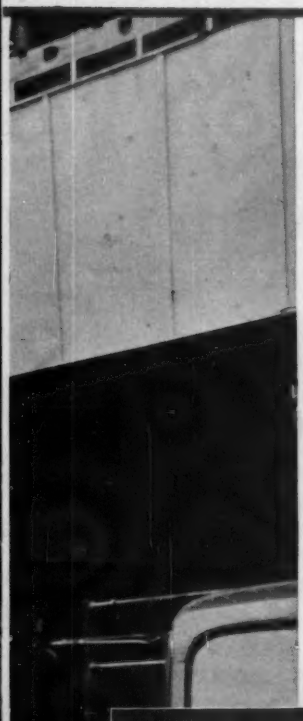
Spiral-wound metallic gaskets actually adjust to changing operating conditions. Gaskets can be installed without grease or cement. May be re-used if necessary.

**Flexibility in Choice**—To simplify application problems, Allis-Chalmers network transformers are available in all three types — oil filled, *Chlorextol* liquid filled, and sealed dry type.

**ALLIS-**

**Meeting Growing System Needs**
**...in city after city**

# Newark Grow!



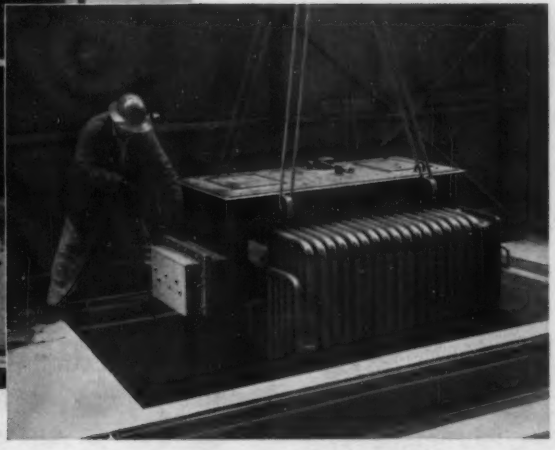
Symbolizing a wholesome optimism, reflected throughout America, is the new cloud-nudging Mutual Benefit Life Insurance Building in progressive Newark, N. J. Along with Newark's healthy growth came the inevitable load concentration growing pains—a condition that has been aided by the installation of two Allis-Chalmers 2000-kva network transformers.

Linked into the *Public Service Electric and Gas Company's* network system, these Allis-Chalmers units are helping to meet increased load demands of power, lighting and air conditioning. Compact design, rugged construction, conveniently located accessories, high thermal capacities, protection against corrosion and flooding — these features make A-C units the logical choice.

### Two Million Kva in Operation

This installation has pushed Allis-Chalmers operating kva near the two million mark. When you consider your next network installation, it will pay you to investigate the reasons why Allis-Chalmers transformers are high on the preference list of utilities everywhere. Get all the facts. Call your nearby A-C district office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

*Chlorextol* is an Allis-Chalmers trademark.



# CHALMERS

A-C ALLIS-CHALMERS

A-5439

*Easy to install*

# Control cable utilizing Du Pont ALATHON® POLYETHYLENE RESINS and ZYTEL® NYLON RESINS has small diameter . . . is light in weight

Control cable insulated with ALATHON 5B polyethylene resin and jacketed with ZYTEL 33 nylon resin and ALATHON 4 is both small in diameter and light in weight. As a result, the cable is easy to work . . . installations are speeded by its ease of pulling and cleanness in handling.

Since ALATHON 5B has excellent electrical properties, a thinner primary insulation can be used. Its low power factor and low dielectric constant keep energy losses at an economical minimum.

ZYTEL 33, used as a skin over the primary insulation, imparts exceptional toughness to the cable construction. This is important at termination points, where rough handling can be expected, and in cases where the cable may get overheated.

Jacketing of ALATHON 4 has remarkable toughness and strength, giving maximum protection, long service life, and maintaining a neat appearance. It also offers outstanding resistance to abrasion, moisture, and weathering.

Du Pont has established a family of ALATHON polyethylene resins, each suited to a range of insulating and jacketing applications. Consult with your supplier. He will be happy to explain the advantages of a wire and cable construction utilizing an ALATHON tailored to meet your specific requirements; or write to E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Room 48-9-23, Wilmington 98, Del.

*Watch the Du Pont Show of the Month—Ninety minutes of the best in live television—CBS network.*

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

"You know Wayne:

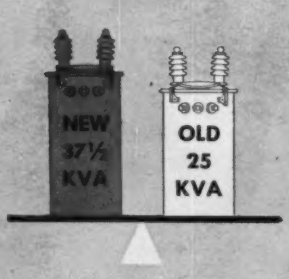
# KUHLMAN HAS REDUCED WEIGHT UP TO 40%

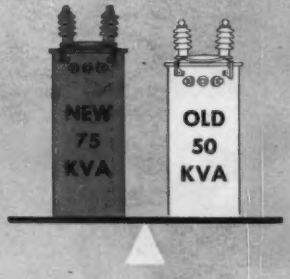
## Take these popular distribution transformer KVA sizes for example:"

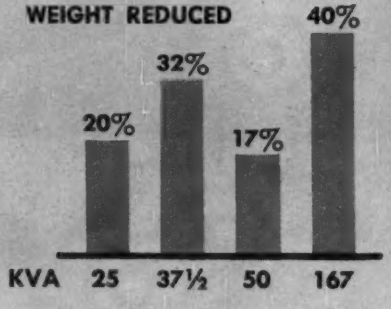
*Do you know this Kuhlman Salesman?* *

During the last few years Kuhlman distribution transformers have been made lighter, smaller and shorter. They are easier to handle, require less storage space, and in the higher KVA ratings save the cost of larger poles.

This modern trend to lighter, more compact design was originally started by the Kuhlman Bent Iron Core more than 20 years ago. Today refinement of the "Bent Iron" principal has made even greater improvements possible. For example:




The 75 KVA transformer now requires the same pole as the old 50 KVA—the 100 KVA weighs approximately the same as the old 75 KVA. In fact, all popular ratings are substantially lighter, as shown in the above chart.

* KUHLMAN "Salesman of the Week"

If you can identify this Kuhlman Electric Co. representative, and are the first one to notify Dept. SA-1, Kuhlman Electric Co., Bay City, Michigan, you will receive a valuable gift certificate. Each week a different Kuhlman representative is featured . . watch for the Kuhlman salesman who calls on you.

OLD 167 KVA NEW 167 KVA

**SPECIAL FEATURES:**

- ★ **Flat cooling tubes to reduce width.**
- ★ **Height reduced 31 inches—now the same as a 37½ KVA unit.**
- ★ **Designed for direct pole mounting.**
- ★ **Designed to replace a 75 or 100 KVA unit.**

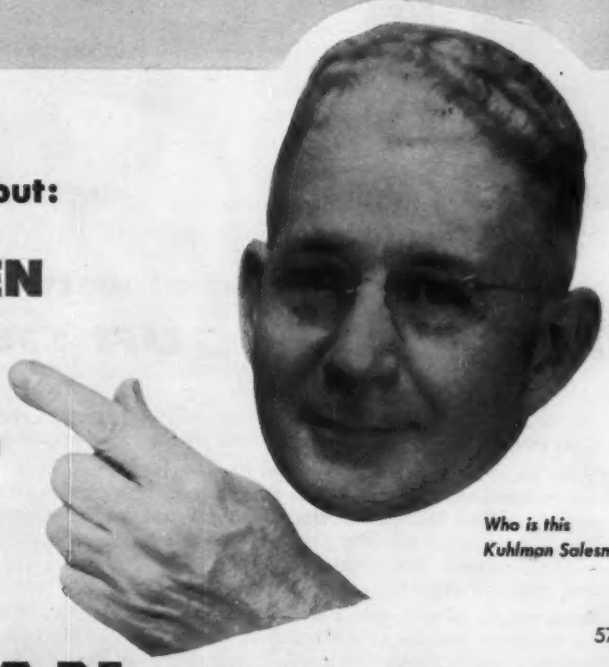
Height has, also, been reduced. The most outstanding example is the 167 KVA which is 31 inches shorter and weighs around 1600 pounds. This unit can now be pole mounted in place of a 75 or 100 KVA unit to give additional capacity without the extra cost of installing heavier poles or platforms.

The 167 is only one of the many ways Kuhlman is meeting the need for shorter, lighter transformers. Ask for our price list PL-200A and check the latest in Kuhlman weights and dimensions.

**"Not only weight, Fred, but:**

# HEIGHT HAS BEEN CUT 38%, TOO

**Look at the big reduction on the 167 KVA:"**

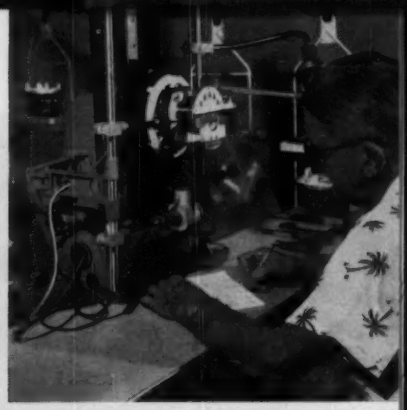


*Who is this Kuhlman Salesman?* *

579c

# KUHLMAN ELECTRIC COMPANY

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA



All incoming meters are tested, results tabulated permanent record cards in the Florida Power Corpo tion Meter Shop.

S. B. Vaughn, Superintendent of Meters, Florida Power Corporation, checks the meter accuracy records in his department.

## for impartial proof of watthour meter performance

# *LOOK TO YOUR OWN RECORDS!*

Do you want the real facts about your watthour meters and the kind of service they give? Then check your own company records.

Your metering team—the men on the bench, the metering superintendent, the girls in the record department—are all familiar with Sangamo Meters and their fine performance. We think that you will be surprised, and pleased with the sustained accuracy of the Sangamo Meters on your lines—even after years and years of service.

Sangamo J2 Meters give you straight line accuracy to 100 amperes . . . corrosion-resistant construction . . . high torque, lifetime bearing system . . . high insulation level . . . and *slow disk speed*—five good reasons why the J2 is your best investment in a watthour meter.

## *SANGAMO ELECTRIC COMPANY*

SPRINGFIELD, ILLINOIS

JM57-6

PREFORMED ARMOR-GRIP SUSPENSION UNITS provide a

# Pretty Soft Life for a Conductor

... cradled in durable neoprene

No vibration fatigue here. The Preformed Armor-Grip Suspension Unit (AGSU) eliminates failure by eliminating stress concentration.

The conductor is cushioned in a split neoprene core, held securely by Preformed rods that never lose their tight grip, and supported in an aluminum housing. Conductor is protected and longitudinal stresses are distributed through the entire length of the rods—not at one point.

Like other Preformed line accessories, the AGSU obsoletes bolted hardware. It's easier to apply (no tools needed), costs less, does a better job. You get mechanical strength and electrical protection, and—because of the smooth contour and large diameter of the rod ends—corona emission and radio influence are minimized.

Want to know more about the Preformed Armor-Grip Suspension Unit —or see the application demonstrated? Write PREFORMED LINE PRODUCTS COMPANY, 5349 St. Clair Avenue, Cleveland 3, Ohio. Cable Address: Preformed-Cleveland . . . in 10 years the leading manufacturer of armor rods, dead ends, Guy-Grip dead-ends and other line accessories.

PLP

*You can look up to Preformed*

Made in accordance with or for use under one or more of the following U. S. Patents: 2,722,393; 2,775,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.

# 501 Kva Cluster-Mounted on One Pole.

## Detroit Edison does it with 3 167-kva Featherweight POLE STARS

Here you see how Detroit Edison Company solved the problem of serving a small manufacturing plant without going to the trouble and expense of installing either a second pole and platform, or a vault.

Cluster-mounting of Featherweight Pole Star 167's can be an effective, economical way to provide power for shopping centers . . . or to increase service to newly expanded commercial sections. Introduced by Pennsylvania in 1953, Featherweight Pole Stars "pioneered" the extension of pole mounting to 167-kva transformers. They have proved easy to handle, easy to install under all conditions . . . and linemen like the "slim" Pole Star design that encroaches so little on the climbing area.

Featherweight Pole Star 167's are available for pole mounting in every standard distribution voltage through 16,340 volts. Like all other members of the Pole Star line, they offer the long-range advantages of Pennsylvania's patented "lap-on-top"core.

Pennsylvania Transformer Division, McGraw-Edison Company, Box 330, Canonsburg, Pa.

*Why Utility Engineers asked for this* POLE STAR *transformer*

★ Will replace any single phase 75- or 100-kva pole-mounted transformer to provide 67% to 123% more capacity

★ Weighs less than 1500 pounds

★ Lower in overall height than average 100-kva transformer

★ Available in standard voltages up through 16,340 volts

### Mechanical Characteristics

Weighs approximately 1500 pounds.

Conforms to EEI-NEMA Sixth Report.

Overall floor space slightly larger than average for 100-kva transformers.

Overall height approximately 8" less than industry average for 100-kva transformers.

### Electrical Characteristics

Patented "lap-on-top" Pole Star core, combined with effective coil design, results in low losses, low impedance, and good regulation.

Low exciting current found in all Pole Star designs also is inherent in the 167-kva Featherweight Pole Star.

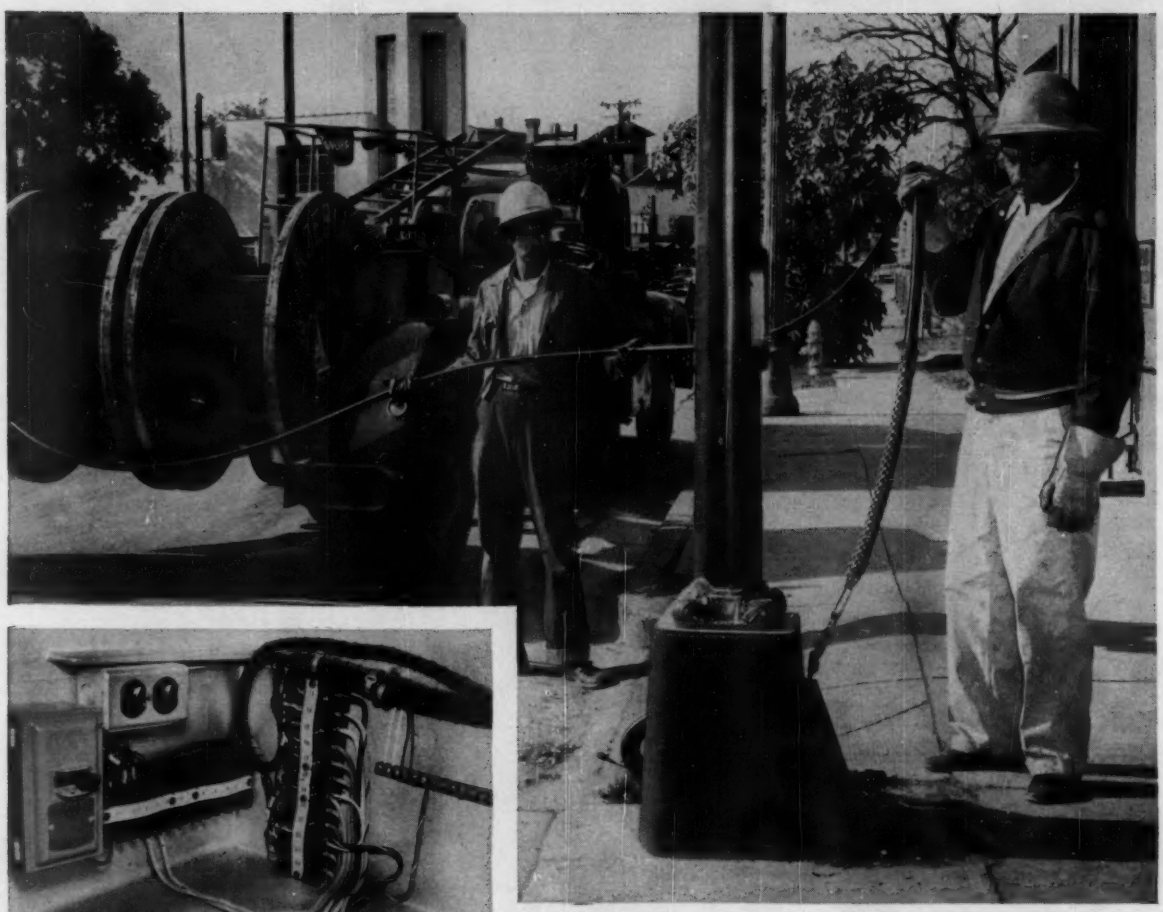
McGRAW EDISON

PENNSYLVANIA TRANSFORMERS pt

PENNSYLVANIA

This trio of Featherweight Pole Star 167's is connected to provide a low voltage of 480Y/277 volts—supplying both three-phase power for machinery and single-phase power for lighting. The high voltage is 4800 delta volts.

# DISTRIBUTION TRANSFORMERS



Individual conductors in the control box are color-coded with vinyl plastic, over insulation of polyethylene.

Cable being installed was manufactured by John A. Roebling's Sons Corporation.

## *Polyethylene and vinyl on cable...*

# teamed against underground troubles

These men in San Antonio, Texas, are installing traffic signal cable that is completely insulated and jacketed with plastic.

The outer covering is tough BAKELITE Brand Vinyl Plastic. Notice that it's being pulled with a Kellems grip. The smooth-surfaced jacket makes pulling through ducts and conduits easy. And the vinyl plastic guards against alkalies, acids, and motor oil.

Inside, the individual conductors, shown in the inset above, have a moisture-resistant colored vinyl jacket over insulation of BAKELITE Brand Polyethylene. The polyethylene was selected for its high insulation resistance, low dielectric constant, and excellent dielectric strength.

You'll find that line wire, service drop, and power cable, as well as communication and control cables, are improved through use of BAKELITE Polyethylene and Vinyl Plastics. Their high standards are assured by a rigid quality-control system. For the latest information on the use of these materials for wire and cable, get Kabelitems No. XX by writing Dept. YC-53.

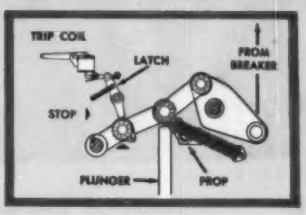
**BAKELITE**
BRAND
**PLASTICS**

**UNION CARBIDE**

**BAKELITE COMPANY,** *Division of Union Carbide Corporation* UCC 30 East 42nd Street, New York 17, N. Y.

The terms BAKELITE, UNION CARBIDE and the Trefoil Symbol are registered trade-marks of UCC.

# Mechanically trip-free operation of this Pneu-Draulic operated breaker means positive protection




## Since 1933—

Allis-Chalmers has built all power breakers mechanically trip-free. Only in mechanically trip-free breakers are contacts and closing mechanism completely uncoupled during tripping operation . . . enabling contacts to open at full rated speed without restriction from mechanism.

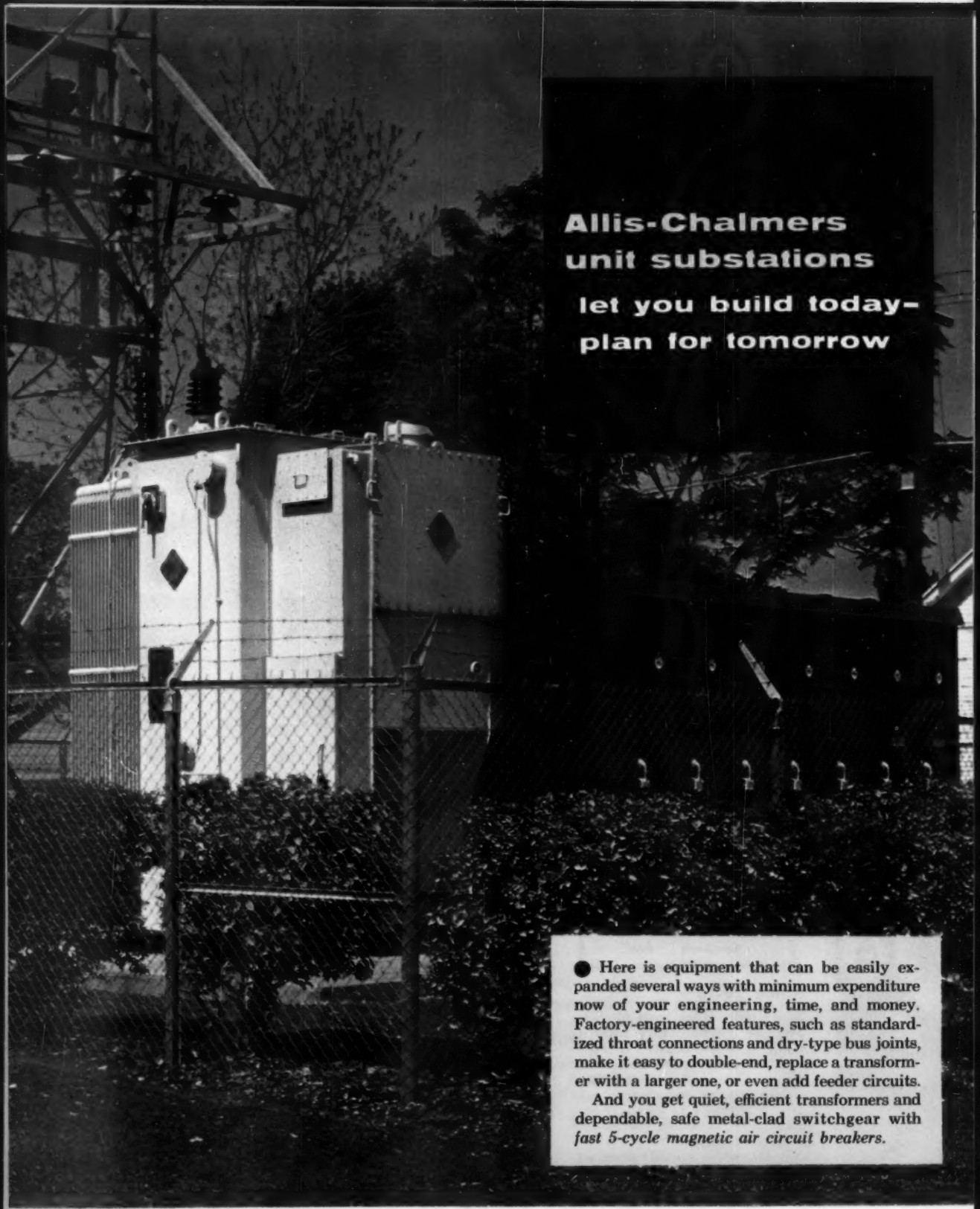
Breakers that are only pneumatically or hydraulically trip-free can't give you this protection.

Pneu-Draulic is an Allis-Chalmers trademark.

*For details of this and other features of Allis-Chalmers power oil circuit breakers, call your nearby A-C office, or write to Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.*

A-5241

# ALLIS-CHALMERS




● Here is equipment that can be easily expanded several ways with minimum expenditure now of your engineering, time, and money. Factory-engineered features, such as standardized throat connections and dry-type bus joints, make it easy to double-end, replace a transformer with a larger one, or even add feeder circuits.

And you get quiet, efficient transformers and dependable, safe metal-clad switchgear with *fast 5-cycle magnetic air circuit breakers.*

A-5246

*For help on your substation problems, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.*

**ALLIS-CHALMERS** *for progress in switchgear*

# NEWS-SCOPE

**FUTURE NEWS ▶** **There is strong undercurrent** among engineering and operating distribution engineers for a secondary voltage higher than 120/240 v to meet future residential loads. However, there appears to be disagreement as to whether this new voltage should be 240/480-v single phase or 265/460-v three phase.

**A good possibility for the remaining vacancy on the TVA board is** K. Sewell Wingfield, say some Washington observers. Wingfield is administrator of Arizona Power Authority. Meanwhile Dr C. E. Brehm, president of University of Tennessee and a recommended contender for the post, has given a reply of "not interested."

**ECAP may style a series of ads which would be aimed at the ladies.** The ads, which would run in women's magazines in 1958, would be designed to help sell private enterprise.

**LATE NEWS ▶** **Sharp rises in the cost of constructing nuclear power plants hamper** building plans of two rural electric co-ops. American Machine & Foundry tells Rural Cooperative Power Assn of Elk River, Minn., it can no longer hold to the agreed price of $5.7 million to build RCPA's reactor. AM&F now sets price at about $3-million higher. And price of Wolverine Electric Cooperative's proposed plant has been increased from $5.4 million to $14.4 million by Foster Wheeler. Actions followed Congress's recent order to AEC to pay directly for constructing such plants for co-ops. Both manufacturers say there is no relation between the two actions.

**There must be greater federal investment** in large-scale power reactor construction, the National Planning Assn urged last week. In its report "Productive Uses of Nuclear Energy," is said the prospect for commercial profit from power reactors is too remote at present to justify reliance exclusively on private investment.

**In a move to speed up the construction start of the Niagara project,** New York Gov Averell Harriman and five legislators approve a $1,025,000 loan to the State Power Authority for preliminary work. Meanwhile, an FPC license for Niagara has been delayed by the deadlock between NYPA's Robert Moses and public officials of the Niagara Falls area over construction details.

**Joint Committee on Atomic Energy unofficially clears the way** for AEC to complete contract negotiations with Central Utilities Atomic Power Associates (Northern States Power Co group) for an atomic power plant. The authorization bill passed in the last Congress requires AEC to submit details of proposed agreements with reactor builders to JCAE.

**Congratulations . . . Howard G Barnett joins Portland General Electric Co** as distribution planning engineer . . . New vice president of United Engineers & Constructors, Inc., is Gerald H. Brown.

**COOKING SURVEY** ▶ **If you want to gain new commercial cooking load fast,** concentrate on 5% of the total market—new construction. EW's third commercial cooking survey shows that new construction accounts for 45% of the new load. Remodeling ranks second with 25%, and replacement and new applications average 16 and 17%, respectively.

**Surveyed utilities did well in 1956.** They added 27% more cooking kilowatts than in 1955. Average kw added in '56 was 5,302, in comparison to 4,162 in 1955. To get this new load, utilities increased their commercial cooking expenditures, spent more per food-service-customer, and used more commercial cooking specialists and all-purpose representatives. But all this paid off in higher EAR. Until recently commercial cooking has been a "sleeping giant." See how utilities are rousing him now (p 81).

**EVENTS** ▶ **Utilities hit a summer peak 7% higher this year than last,** despite the lack of major sustained hot weather. Table and story on p 66. . . . A "career satisfaction" survey shows there are two separate worlds in industry: engineering and nonengineering, and engineers feel ill at ease in the latter (p 70) . . . Hartford Electric Light Co and Connecticut Power Co may merge if stockholders approve plans now endorsed by the boards of both companies (p 70).

**ATOMIC PROGRESS** ▶ **The Atomic Energy Commission is becoming more of a regulatory agency.** Answers to some future questions now hinge on big pending decisions. For instance, does issuance of a construction permit imply that an operating license will be issued later? If not, why gamble? (p 68).

**GENERATION** ▶ **Pumped-storage hydroelectric plants can be an attractive,** economic alternate to steam plants. At suitable sites, such plants can be developed at costs comparable to equivalent new steam capacity. They usually are less expensive than ordinary hydroelectric projects because they require smaller dams and reservoirs, and sites are easier to find. A General Public Utilities author says preliminary studies show "a considerable amount" of pumped-storage hydro can be built for about $140 per kw on the GPU system, and, when planned for reasonable load-factor operation, supports an initial investment up to $25 per kw more than the average cost of steam capacity. This penetrating article tells how to evaluate and justify pumped storage (p 73).

**SUBSTATIONS** ▶ **You can stop oil leaks on conservator-type transformers,** most of which occur around the bolts holding on the top, by putting a thin lead washer under the head of the bolt and another under the nut. Then pump insulating varnish around the bolt. If this doesn't work, the varnish may have to be pumped in through a hollow bolt. See sketch on p 91.

## PREVIEW OF THIS WEEK'S ELECTRICAL WORLD

**INDUSTRIAL** ▶ Power won't be shut off to a continuous-process area of Monsanto Chemical's plastics division in Texas City, Texas, unless trouble develops right in that area itself. With an eye on its single power source, Monsanto has set up a special 66-kv switching station and individually protected load centers. Using pilot-wire and differential relays, Monsanto coordinates these load centers with protection provided by Community Public Service (p 78).

**PEOPLE** ▶ Alabama Power Co elevates Walter Bouldin to the presidency and E. C. Easter to the executive vice-presidency. Lewis M. Smith, formerly president, is vice-chairman of the board . . . GE names Jack S. Parker vice-president, public- and employee-relations (p 130).

**SELLING** ▶ "Fiestas" help sell commercial cooking equipment to small restaurateurs who can't attend the big shows and who are called upon infrequently by salesmen, reports Wisconsin Power & Light. Fiestas are joint projects of the utility and food and equipment suppliers. The first fiesta in 1954 drew four times the number expected; attendance and load has been going up ever since (p 98).

**FINANCE & RATES** ▶ A little scratch-pad figuring shows the cost of money to electric utilities may have risen 15% in the past year, an increase in expenses worth factoring into pending rate cases . . . Speaking of rates, Boston Ed is asking for a $2.4-million annual hike, and Mississippi P&L is requesting a $616,000 annual cut (p 121).

**TAXES** ▶ Consumers Public Power District in Nebraska proposes paying more taxes in 257 incorporated cities served at retail (p 122).

**HEATING & COOLING** ▶ NEMA should set up standards for space-heating equipment before "dubious products" and dissatisfied customers kill off this new industry, writes the editor of a contractor's magazine. Right now, the industry is in a "wattage race" which, in poor designs, may lower comfort and heat efficiency while creating hazards (p 102).

**MANUFACTURERS** ▶ C. H. Wheeler Mfg Co has shipped a condenser capable of handling 1.6 million pounds of steam an hour to Consolidated Edison's Astoria, N. Y., station . . . Okonite gets $270,000 contract to make a 115-kv, oil-filled cable to transmit power from St. Lawrence power project across Lake Champlain into Vermont (p 125).

**NEW EQUIPMENT** ▶ Fly-ash precipitator control has no moving parts and requires no maintenance; it holds voltage across the gas stream just below the flashover point . . . Weatherproof vertical motors now come in a new line of 250 hp and up, available as squirrel-cage or wound-rotor induction, or synchronous . . . Submersible rectifiers of oil-filled silicon type are available in ratings up to 500 kw (p 111).

# ENGINEERING TRENDS

**Temperature loss in the intermediate heat exchanger** of a liquid metal cooled reactor may be very small because high heat transfer rates are obtained with liquid metal on each sides of thin walled tubes.

**Selenium is valuable for photoelectric applications** because it conducts electricity much more readily in the light than in the dark.

**Mechanical duty imposed on bus conductors by short circuit currents** may be as little as 25% of that calculated by conventional methods under certain conditions of electrical damping and mechanical natural frequency.

**Rate-of-rise of recovery voltage after interruption of a fault** is an important factor in determining circuit breaker and system characteristics.

**Lightning arresters common grounded with cable messenger and shielding** are considered necessary at all aerial-cable open-wire junctions.

**Grounded wye systems are recommended for 3-phase installations** in industrial plants because they are safer for both equipment and personnel; maintenance cost and time are less; and cost of new installations are equalized by ground detecting and ground location systems necessary in ungrounded systems. But it must be recognized that with an ungrounded system, the plant operation can continue with a ground on one phase until it is convenient to shut down and clear the original ground.

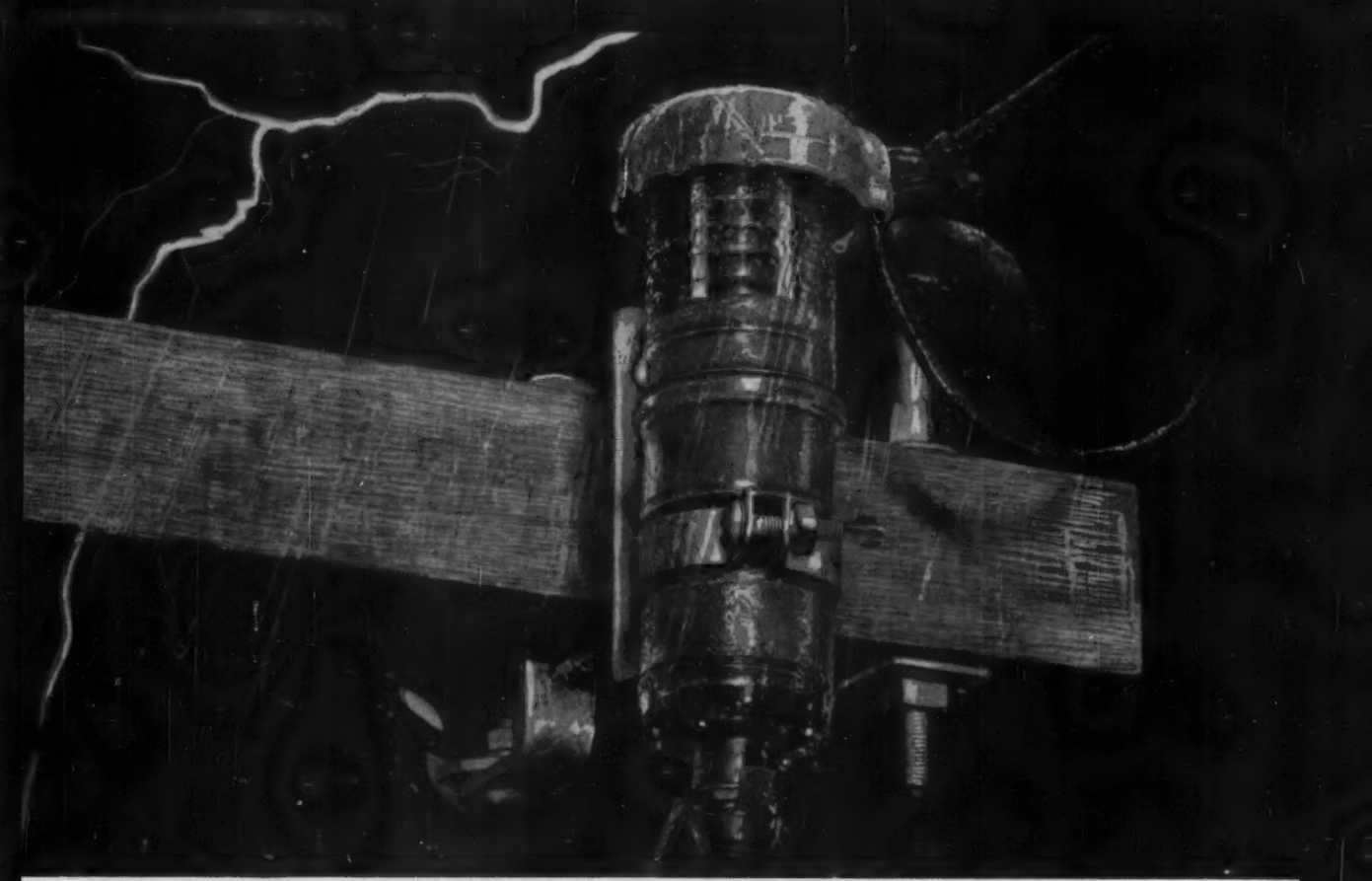
**Great future is predicted for quartz heat lamp** in commercial cooking, food processing, and industrial heating. Its ability to provide 1,500F heat almost instantly is its biggest asset.

**Adoption of general standards for nuclear construction materials** would be premature at this time. Increasing knowledge of the effect of environmental conditions should produce better and surely less expensive materials then now applied.

## FROM EDITORS IN THE FIELD

**Satisfactory results have been obtained with a 30-kva silicon rectifier** used as part of the power supply for the precipitator at the Milliken station of New York State Electric & Gas Corp. It is oil-immersed and placed in the same tank with the precipitator power supply step-up transformer. Since its installation in late 1956, the rectifier has had a circuit efficiency of 96% or better.

**Distribution transformer stocks have been cut in half** as a result of a study on transformer size requirements conducted by Toledo Edison Co. Before undertaking the study the utility used 49 different kinds of distribution transformers. Now Toledo Edison stocks only ten kinds and confines purchases to four basic sizes—7,200-120/240 v or 240/480 v in 10, 25, 50 and 100-kva sizes.



# Why More Utilities Are Selecting L-M Type E Valve Arresters

L-M valve-type distribution lightning arresters have established an outstanding performance record by giving millions of service years of reliable protection. The Type E has been a leader in the field, and hundreds of thousands have been giving excellent service for many years. The failure rate is phenomenally low.

Here are some of the reasons for this remarkable record, and for the great increase in customer preference for the L-M Type E valve arrester.

**Balanced Sparkover:** Spark gap is a ladder-gap design, pre-set and then permanently sealed in the arrester housing. It cannot be knocked or burned out of adjustment. Gap is precision-made to assure optimum balance between 60-cycle sparkover and impulse sparkover.

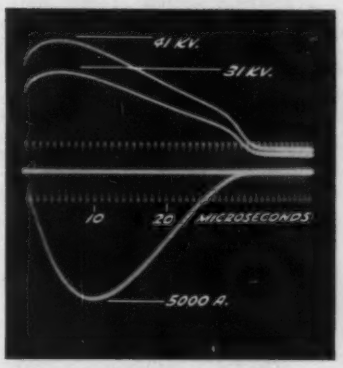
**Low IR Drop:** L-M now has a new Type E arrester, the E-3, which provides even lower IR drop than its popular predecessor. The new Type E-3 also provides greater durability and discharge capacity. These advantages are made possible because the new Type E-3 has an improved gap which provides greater 60-cycle interrupting ability, permitting reduction of the resistance of the valve element. The oscillogram shows the improvement in IR drop between the Type E and the new Type E-3.

**Positive Protection:** L-M valve arresters have a Pyrex glass housing which permits visual inspection of the spark gap in the field. Should the arrester become damaged, telltale evidence can be readily seen through the glass. If the arrester should fail to interrupt 60-cycle follow current for any reason whatsoever, L-M's patented Isolator provides positive assurance against grounding the feeder by disconnecting the ground lead from the arrester.

Other features include Zincilated (Zincilate No. 100) arrester housing clamp, fibre-glass cap, and fibre-form packaging. New packaging provides additional strength to the carton so arresters can be stacked easily on pallets.

**Get Complete Information**

Get the whole story of L-M arrester performance and application. Ask the L-M Field Engineer, or write for a copy of bulletin on the new Type E-3 arrester, to Line Material Industries, Milwaukee 1, Wisconsin.




Oscillogram shows reduction in discharge voltage in the new Type E-3 valve-type lightning arrester. Curves are for a 9 kv unit. IR drop has been reduced from 41 kv to 31 kv—a remarkable improvement in a unit that already has established an enviable performance record over many years' service.

**LINE MATERIAL Industries**

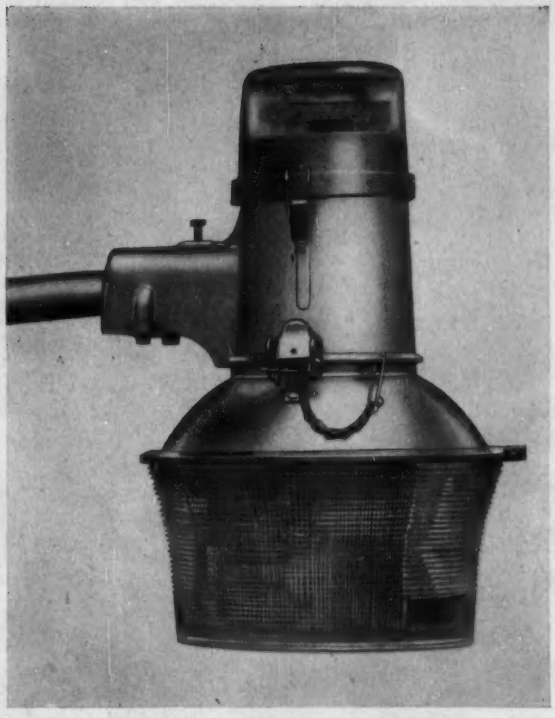
McGRAW-EDISON COMPANY

LM Lightning Arresters

McGRAW EDISON

# L-M Suburbanaire Gives Protection, Adds Off-Peak Load

**Utilities rent customers this photocell-controlled luminaire at about $3 a month; it provides all-night lighting for security and recreation; increases revenue for the utility. Open-type refractor keeps maintenance at minimum.**



A number of utility companies have had excellent results with a new plan for individual outdoor lighting for customers. Here, briefly, is the plan:

- The utility installs the L-M Suburbanaire on the customer's premises without charge. The Suburbanaire is an open-type, low-cost luminaire with built-in photocell control, thus providing all-night yard lighting.
- The utility maintains the unit and keeps it in operation.
- The utility provides power which does not go through the customer's meter.
- Cost to the customer is a stated amount per month—usually $3 or $3.50—which covers all costs. The utility retains ownership of the luminaire.

Customers like the plan, because it safeguards property, cuts vandalism and theft, reduces accidents, and has some prestige value, particularly in areas where there is no street lighting.

From the utility standpoint, the plan increases revenue in off-peak hours. Here is what some utility men say:

"We have installed more than 200 L-M rural lights, increased our off-peak load by more than 50 kw, and have had many expressions of complete satisfaction from our customers."

"The Photocell Suburbanaire assures us of an off-peak load of about 1000 kw hours per unit. We have installed almost 400 Suburbanaire luminaires, many of these replacing the old makeshift radial fixture arrangement. Customer reaction has been excellent . . . equipment and gasoline theft has dropped substantially and vandalism is almost nil."

"From time to time, customers have asked us for outdoor lighting for rural and suburban homes. Since January, 1957, we have been installing L-M's new Suburbanaire unit. The long-life lamp and photo-electric cell, plus ease in relamping and cleaning the open refractor, will keep our maintenance costs at a very low minimum. This makes it possible to offer this service at a very low cost."

## TYPICAL ANALYSIS OF COSTS

| | |
|---|---|
| **Material:** | |
| Suburbanaire, photocell, bracket, etc. | $ 70.00 |
| Installation labor | 30.00 |
| Annual power cost (based on 300 watt lamp burning 4000 hrs. per year @ 1¢ kwh) | 12.00 |
| Lamp replacement, maintenance | 9.00 |
| **Total Cost First Year** | **$ 121.00** |
| Outdoor lighting equipment is built to last 20 to 25 years, but if this equipment is amortized over 10 years, the cost will be: | |
| First-year cost (above) | $121.00 |
| Nine times power and maintenance cost (9 more years) 9 x ($12 + $9) | 189.00 |
| 10-year total | $310.00 |
| Interest at 6% | 18.60 |
| Profit, at 10% on $328.60 | 32.86 |
| **Total 10-Year Cost Plus Profit** | **$ 361.46** |
| Annual cost (1/10th) | $ 36.15 |
| Cost per month (1/12th) | $ 3.01 |

**Get The Whole Story**

Ask the L-M Field Engineer for bulletin on the L-M Suburbanaire luminaire and more information on the profitable customer-rental plan. Or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

McGRAW-EDISON

316

**LINE MATERIAL Industries Outdoor Lighting**

McGRAW-EDISON COMPANY

**THE NEW L-M OIL INTERRUPTER provides high-speed circuit interruption on sub-transmission circuits without external arc or flame. The unit costs less than half as much as other interrupters for the same application.**

# New High-Voltage Oil Interrupter For Only $290 Per Pole for 69 kv

## Units cost less than half as much as other interrupters for the same application—$240 per pole for 23 kv and 34 kv, $265 per pole for 46 kv, and $290 per pole for 69 kv.

Now you can get an economical, high-voltage oil interrupter for sectionalizing and switching on sub-transmission circuits. The unit is capable of interrupting load currents, line charging currents, and transformer magnetizing currents. It easily meets NEMA and AIEE standards, including the ice test.

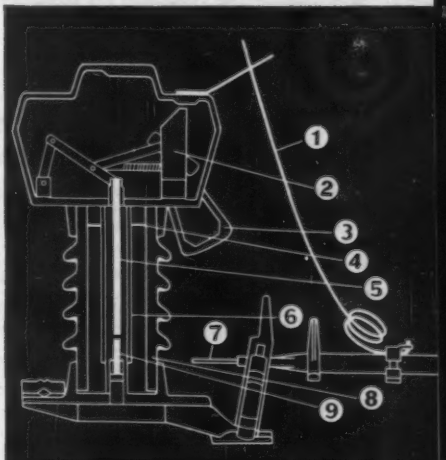
### Contacts Separate At High Speed

The L-M interrupter consists of an oil-filled unit housed in a porcelain insulator, and a rod to shunt the current through the interrupter while the main switch blade is being disconnected. As the switch blade rises, it engages a spring trip lever which rises to over-toggle position, causing the contacts within the unit to separate under oil at high speed. The speed of the moving contact is independent of the operation of the main switch blade.

Contacts have long-life copper-tungsten arcing tips. All linkages are made of aluminum for lightness and fast operation. A simple fiber-washer arrangement provides a spiral passage for the pressure-generating arc, forcing oil and un-ionized gas around the arc core as the moving contact is withdrawn. This assures rapid arc extinction at low current values.

### Ratings 23 kv Through 69 kv

L-M's new interrupter is available in 23, 34.5, 46 and 69 kv ratings. Continuous current rating is 600 amperes; momentary and short-time current ratings are 40,000 amps. for 10 cycles, and 25,000 amps. for 4 seconds. The unit can be installed on any of L-M's PV switches without altering the original parts. The addition of the interrupter does not change the electrical clearance or the phase spacing of the switch.




**Cutaway View of Oil Interrupter**

1. By-pass rod
2. Toggle mechanism
3. Trip lever
4. Oil level
5. Moving contact
6. Interrupter
7. Trip rod
8. Bushing
9. Stationary contact

### Get Complete Information

Ask your L-M Field Engineer for more complete information on L-M's new high-voltage oil interrupter and on L-M's outstanding power switching equipment. Or write Line Material Industries, Milwaukee 1, Wis.

317

**LINE MATERIAL Industries**

McGRAW-EDISON COMPANY

LM Power Switching Equipment

McGRAW EDISON

# HOW L-M INDUSTRIAL CAPACITORS GIVE A HIGH RETURN ON INVESTMENT

## *Raise low power-factor and reduce kilovars*

...increase load capacity
...improve voltage conditions
...cut power bill

**By N. K. DELANEY**
Product Manager
Capacitors and Regulators
Line Material Industries

Low power-factor costs you money. With low power-factor you do not use your plant facilities efficiently. You also lose part of the electricity you pay for, because of excessive losses. Today, practically every plant has manufacturing processes with loads involving induction motors producing low power-factor. These are such loads as machine tools, pumps, fans, compressors and conveyers.

The use of capacitors improves the power-factor of the load. This reduces the KVA demand, and therefore cuts power costs. It automatically increases the load capacity of the plant circuits, and provides better voltage for equipment operation and lighting. In addition to providing better operation of the plant, capacitors can substantially reduce power costs another way: where there is a power-factor clause, based on a study of the clauses of a number of utilities, capacitors can save many times their cost.

### *Both Large and Small Plants Benefit*

Almost every size of plant having a power-factor clause in its rate structure can justify capacitors. Studies show that it is generally advantageous to improve the power-factor beyond the maximum rate of return, because even though the rate of return becomes less, it is still economically attractive, and besides, additional system power capacity is released. A rough rule is to provide improvement to 90-95 percent power-factor.

The best way to determine the capacitor kilovars to use is to calculate the actual dollar savings for various power-factor values for your particular plant condition. See examples at left.

### *Location of Capacitors*

The maximum benefit from capacitors is obtained when they are located

### Two Examples of Savings With L-M Capacitors

These two examples are typical of the savings on power bills possible through the application of low-voltage industrial capacitors.

#### 1. Small Industrial Plant

Here the rate structure included a monthly KVA demand charge, which averaged $172.28. Installation of $720 worth of capacitors cut the demand charge to $137.80, a monthly saving of $34.48. The savings will pay for the capacitors in 21 months. Here are the figures:

| | | |
|---|---|---|
| **BEFORE Installing Capacitors** | | |
| KW | = | 152 |
| KVA | = | 211 |
| PF% | = | 72 |
| Monthly KVA demand charge. | = | $172.28 |
| **AFTER Installing 80 KVAR of 460 Volt Capacitors** | | |
| Approximate installed cost of capacitors | = | $720.00 |
| KW | = | 152 |
| KVA | = | 166 |
| PF% | = | 92 |
| Monthly KVA demand charge. | = | $137.80 |
| Reduction in monthly KVA demand charge | = | $ 34.48 |
| Number of months required to pay for capacitors out of savings in monthly KVA demand charge | = | 21 |

#### 2. Commercial Lighting User

Here the rate for a commercial user of a large amount of lighting equipment included a monthly KW demand charge with a power-factor penalty clause as follows: the monthly demand charge will increase 1% for each 1% the power-factor falls below 85%PF. Power-factor at the time was running around 76%. Installation of enough capacitors to bring the power-factor to 86% saved $24.41 per month, which is paying for the capacitors in 25 months. It figures out this way:

| | | |
|---|---|---|
| **BEFORE Installing Capacitors** | | |
| KW | = | 120 |
| KVA | = | 158 |
| PF% | = | 76 |
| Monthly KW demand charge. | = | $295.66 |
| **AFTER Installing 30 KVAR of 230 Volt Capacitors** | | |
| Approximate installed cost of capacitors | = | $600.00 |
| KW | = | 120 |
| KVA | = | 140 |
| PF% | = | 86 |
| Monthly KW demand charge. | = | $271.25 |
| Reduction in monthly KW demand charge | = | $ 24.41 |
| Number of months required to pay for capacitors out of savings in monthly KW demand charge | = | 25 |

Individual Dustproof Capacitor Unit

at the load. This is true for release of system capacity, voltage improvement, and power bill savings. On the other hand, other factors should be considered, such as load diversity, particularly when the plant contains a number of small loads. L-M engineers can help you with such problems.

### *Complete Engineering Service*

As a large manufacturer of capacitors for utility applications, Line Material Industries offers complete engineering service on industrial capacitor installations.

Line Material development engineers will cooperate with you to determine the amount of capacity released by power-factor correction, voltage improvement, rate of return on capacitor investment, and the most advantageous capacitor location.

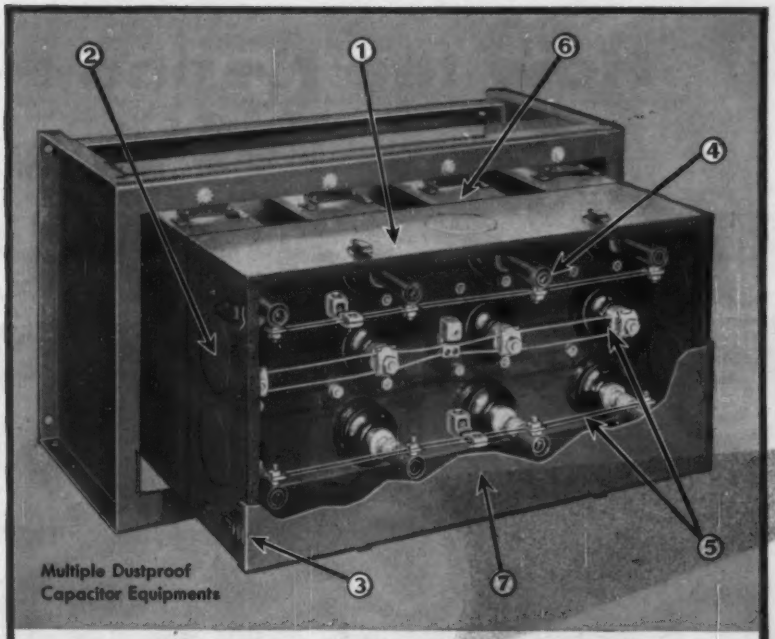
### *Complete Line of Industrial Capacitor Equipments*

Line Material Industries offers a complete line of standard industrial capacitors, 230 to 575 volts, for installation at the motor, on the supply side of motor protective and switching devices, or at load centers.

Line Material capacitor equipments are dustproof. They can be floor, wall, or ceiling mounted. Multiple equipments are factory assembled into desired sizes, and completely wired. Installation is simple and fast. Equipments include boric acid indicating-type, terminal-mounted fuses.

### *Get Complete Information*

Line Material capacitors may be the solution to your problem to increase load capacity, improve voltage conditions, or cut power billing. Call the nearest Line Material office for complete information and the location of the nearest distributor of Line Material equipment. Or write Line Material Industries, Milwaukee 1, Wisconsin.




Multiple Dustproof Capacitor Equipments

# NEW L-M INDUSTRIAL CAPACITOR EQUIPMENTS

## *Have Outstanding Design Features*

1. ***Enclosure***—one-piece all-steel construction.
2. ***Knockout***—3-inch on all four sides.
3. ***Cover***—one-piece, fastened by spring clips, easily removed.
4. ***Fuses***—boric acid indicating type, terminal mounted.
5. ***Internal Wiring***—factory assembled.
6. ***Unit***—strong solder-sealed bushings with low temperature Elemex liquid dielectric.
7. ***Finish***—primer followed by one coat of alkyd-resin paint.

Available in standard three-phase and single-phase ratings, 230, 460, and 575 volts.

Sold to industry through distributors. Call the nearest Line Material office for location of nearest distributor or write Line Material Industries, Milwaukee 1, Wisconsin.

**LINE MATERIAL Industries**

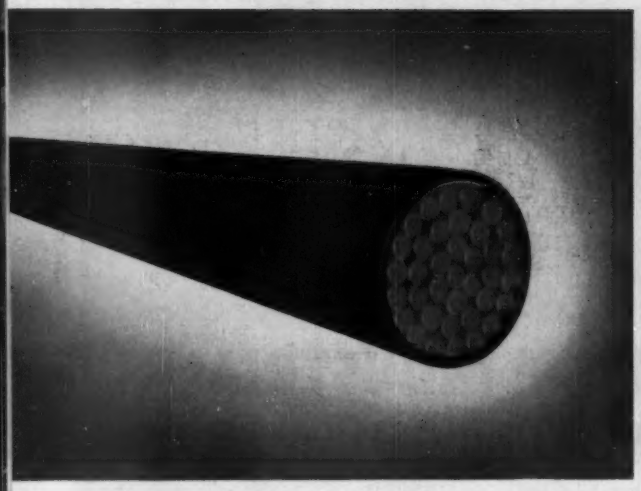
McGRAW-EDISON COMPANY

Transformers—Capacitors—Reclosers
Protective Equipment—Street Lighting
Power Switching Equipment—Regulators
Line Construction Materials—Fibre Conduit.

McGRAW EDISON

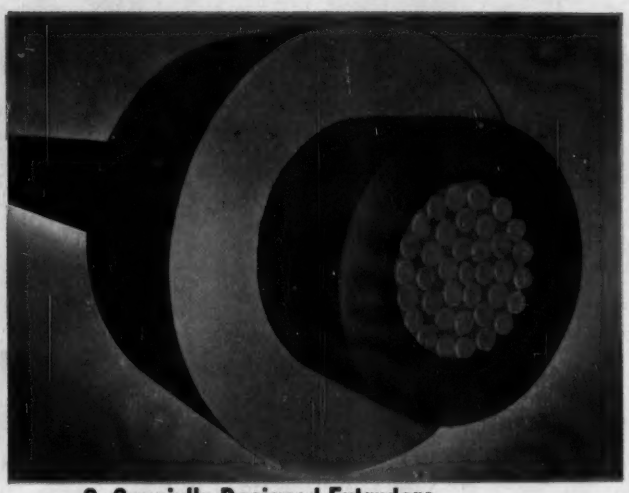
311

# How the Nepco Process makes Butyl better



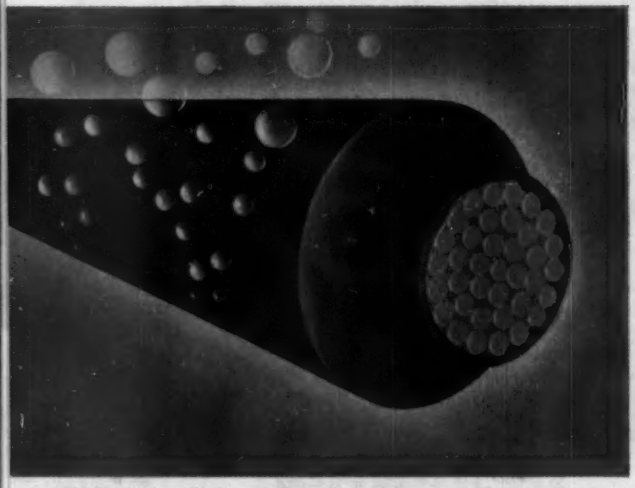
## 1. Vacuum Chamber Core Cleaning

All cores or copper stranding which in high voltage applications is normally wrapped in a special semi-conducting impregnated tape is passed through a high vacuum chamber to "boil-off" absorbed gases and moisture from the core.



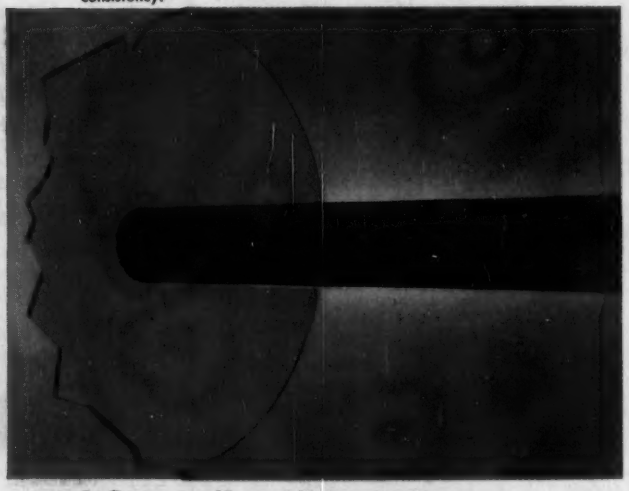
## 2. Specially Designed Extruders

After investigation, NE selected extrusion as the best method of applying a reliable dense, uniform insulation without troublesome interfaces. Since standard extruders were erratic in their capacity to process Butyl rubber, NE installed new equipment specifically designed to slowly work Butyl rubber at its optimum consistency.



## 5. Fugitive Vulcanizing Agents

Vulcanizing agents that leave the by-products of the vulcanizing action in the insulation reduce cable service life and electrical stability. NE has developed fugitive vulcanizing agents with volatile decomposition by-products that can be eliminated from the cable construction.



## 6. Pressure Vessel Vulcanization

NE Butyl is continuously vulcanized at over 400 degrees in a specially designed 200 foot pressure vessel . . . long enough to permit thorough saturation of the reactive centers and to allow the Butyl to interbond with the semi-conducting strand shielding tape to form a continuous mass.

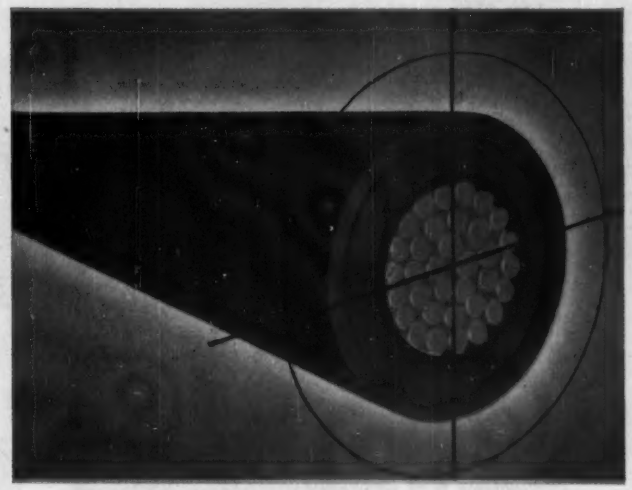
**don't say <u>any</u> wire**

Butyl rubber has inherent characteristics that make it an ideal insulating material for high temperature, high voltage wire and cable. It has outstanding resistance to heat, ozone and moisture.

To take full advantage of these characteristics requires special know-how and special equipment on the part of the wire and cable manufacturer. Here are eight things which National Electric does to get the best out of Butyl rubber and make NE Butyl insulated wire and cable the most dependable on the market.

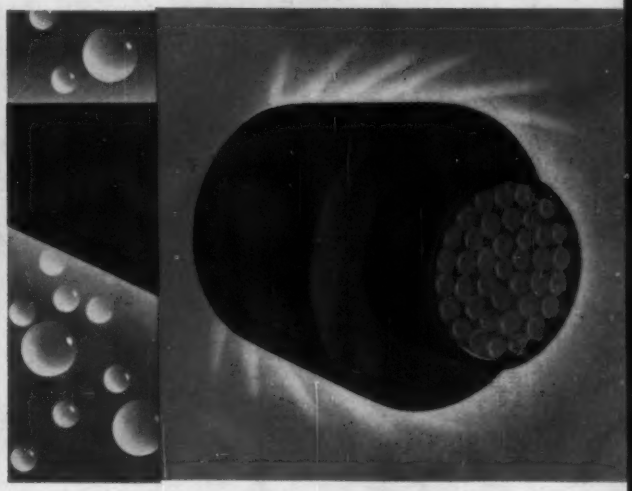
# National Electric Products

Pittsburgh, Pa.: 2 Plants • 12 Warehouses • 41 Sales Offices



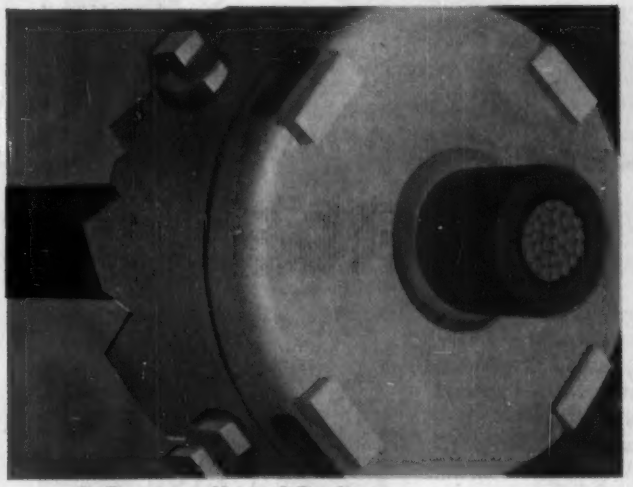
## 3. Controlled Concentricity

**Every foot of cable is checked by a special monitoring station to maintain a perfectly centered core and uniform wall thickness before the material enters the vulcanizing chamber.**



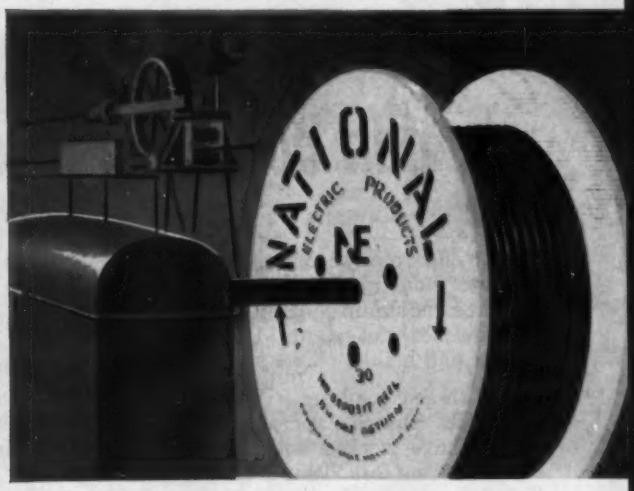
## 4. Water Cushion Processing

**NE Butyl Rubber rides into the vulcanizing chamber through a high pressure water seal that molds the rubber uniformly onto the cable, impregnates the interstices of the shielding tape before vulcanization.**



## 7. Pressure Vessel Cooling

**Perhaps the most important part of the Nepco process. NE Butyl insulated cable is slowly cooled in a second pressure vessel under the same pressure at which it was vulcanized. This cooling under high pressure forces gaseous by-products out of the insulation . . . permits the use of volatile vulcanizing agents which leave no harmful residuals behind.**




The inherent inertness of the Butyl rubber polymer permits the insulation to be compounded and vulcanized to a much tougher and mechanically stronger material.

A typical National Electric Butyl formulation has at least twice the tensile strength specified for an oil base insulation and will maintain this margin of superiority during long term accelerated service tests. That's why when you plan to install Butyl rubber insulated wire and cable . . . don't say *any* wire . . . say NE Wire.

**. . . say NE wire**

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The expansion of Person Station

# HOW WESTINGHOUSE HELPS HARNESS A RUNAWAY DESERT BOOM

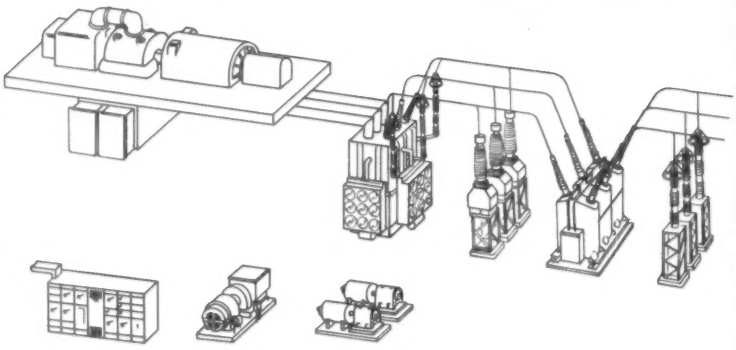
"Runaway desert boom" are the words of a feature writer for the Albuquerque Tribune, as he described the industrial expansion that has abruptly doubled the city's population and multiplied its appetite for electric power four times.

How Public Service Company of New Mexico expanded Person Station to handle this upsurge, and the Westinghouse equipment they used, is unfolded on the following pages.

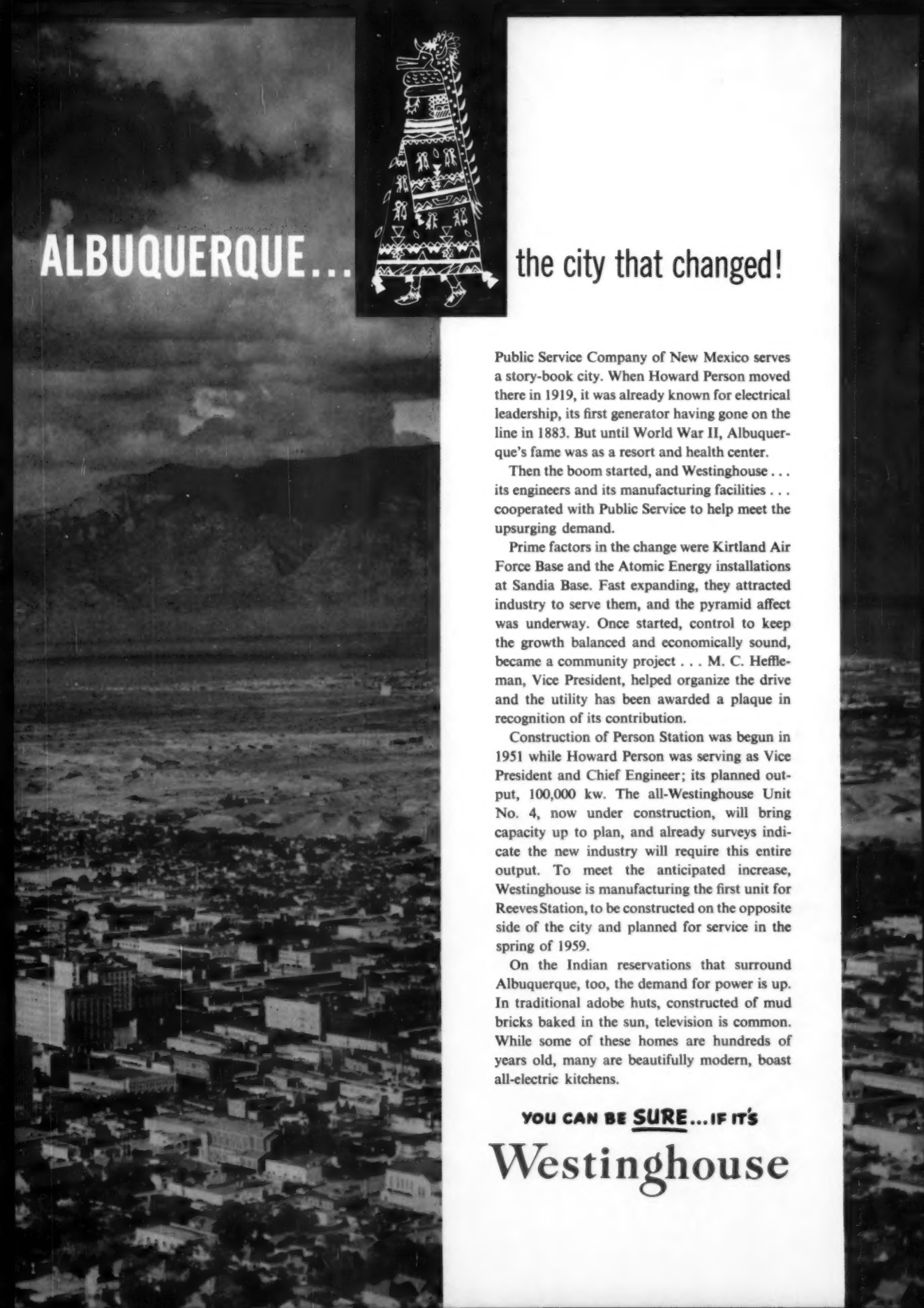
YOU CAN BE SURE...IF IT'S Westinghouse

Howard Person (far right) Consultant to Public Service Company of New Mexico. With him is D. H. Pollard of Westinghouse.

# WESTINGHOUSE EQUIPS PERSON UNITS 3 & 4 TO POWER-UP



Indians on the reservations "Live Better Electrically." Above diagram shows the array of Westinghouse coordinated equipment being installed in Person Station Unit No. 4. Stearns-Roger are the Consulting Engineers and Constructors.



# ALBUQUERQUE... the city that changed!

Public Service Company of New Mexico serves a story-book city. When Howard Person moved there in 1919, it was already known for electrical leadership, its first generator having gone on the line in 1883. But until World War II, Albuquerque's fame was as a resort and health center.

Then the boom started, and Westinghouse . . . its engineers and its manufacturing facilities . . . cooperated with Public Service to help meet the upsurging demand.

Prime factors in the change were Kirtland Air Force Base and the Atomic Energy installations at Sandia Base. Fast expanding, they attracted industry to serve them, and the pyramid affect was underway. Once started, control to keep the growth balanced and economically sound, became a community project . . . M. C. Heffleman, Vice President, helped organize the drive and the utility has been awarded a plaque in recognition of its contribution.

Construction of Person Station was begun in 1951 while Howard Person was serving as Vice President and Chief Engineer; its planned output, 100,000 kw. The all-Westinghouse Unit No. 4, now under construction, will bring capacity up to plan, and already surveys indicate the new industry will require this entire output. To meet the anticipated increase, Westinghouse is manufacturing the first unit for Reeves Station, to be constructed on the opposite side of the city and planned for service in the spring of 1959.

On the Indian reservations that surround Albuquerque, too, the demand for power is up. In traditional adobe huts, constructed of mud bricks baked in the sun, television is common. While some of these homes are hundreds of years old, many are beautifully modern, boast all-electric kitchens.

YOU CAN BE **SURE**... IF IT'S

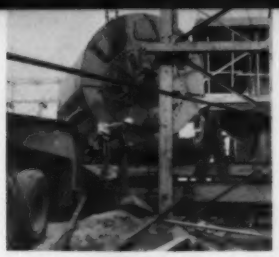
# Westinghouse

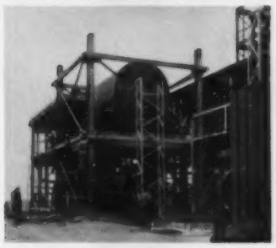
# HEAT, WIND AND SAND...**WESTINGHOUSE** TURBINE GENERATORS

Out in the arid desert, where cloudless sunlit skies are the year-round rule, outdoor construction might seem ideal for a generating station. But the desert brings a problem all its own . . . sand. Sand and dust, whipped by winds off the nearby mountain range, almost defeat the economy offered by outdoor construction. Almost . . . but not quite.

Basically, Person Station follows outdoor principles. Boilers, gas-fired with oil as standby, are outdoor. The building itself houses pumps, condensers and most auxiliary equipment, with turbine-generators on the roof. To protect turbine-generators during open periods for inspection and maintenance, Person Station has weather resistant enclosures over the Turbine Generator Unit. With removable hatches for easy crane access, these enclosures can be pressurized to keep them free from the hazard of unpredictable dust storms while machines are open for work.

In the generators, Thermalastic®, the exclusive Westinghouse insulation, retains its elasticity and insulating qualities over the complete range of operating temperatures.





# INGENUITY BOOSTS LIGHT WEIGHT GENERATOR INTO POSITION IN 15½ HOURS

Normal time for standard cribbing techniques to move a 30,000 kw generator on to the foundation, according to the Construction Superintendent of Stearns-Roger, (Consulting Engineers and constructors), could run as much as two weeks, dependent upon conditions.

But here's how imaginative engineering shortened the job to just 15½ hours. When the 8:00 a. m. shift hooked on to Person Station's No. 4 generator last March 13, they moved it to a specially prepared elevating rig. By running it up the full reach of four jacks, then bolting it to the frame, reducing the jacks and bolting them up, reach by reach, the 95-ton generator was in position by 11:30 p.m., before a third-shift call was necessary.

## PROVE THEY CAN TAKE IT

Turbine-generator Unit No. 3 at Person Station is a Westinghouse 30,000 kw ASME-AIEE Preferred Design; Unit No. 4 will be a duplicate. Precise factory balancing of turbine and generator rotors —under actual operating speed and temperature conditions, minimizes field balancing, and speeds installation.

Max Niese, Mechanical Engineer, Public Service Company of New Mexico, is shown discussing the lifting technique with Brakey Wallace, Superintendent of Construction for Stearns-Roger. Helping substantially in setting the erection record was the fact that the generator for Unit No. 4 was received completely assembled, ready for placing on the foundation.

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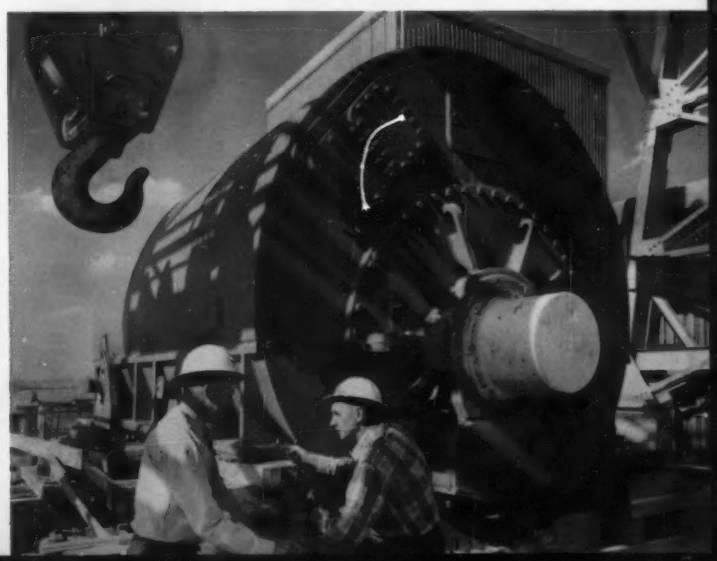
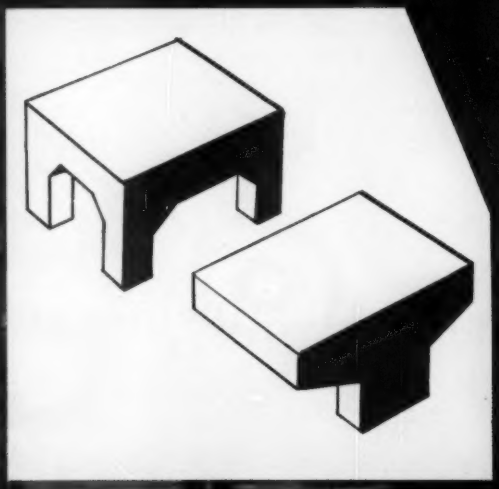


# NEW FOUNDATION DESIGN CUTS COST OF TURBINE-GENERATOR INSTALLATION



First worked out by Stearns-Roger in collaboration with Howard Person, a totally new "T" foundation was developed for the turbine-generators in Person Station. Replacing the conventional four or six pedestals of most turbine foundations with two broadlegged "T's", these foundations offered substantial savings in forms as well as in the volume of reinforced concrete required. Having proved successful in the 20,000 kw units installed first, this type of foundation has now been applied to the 30,000 kw units. Lighter weight and vibration-free characteristics of Westinghouse turbine-generators made this arrangement feasible.

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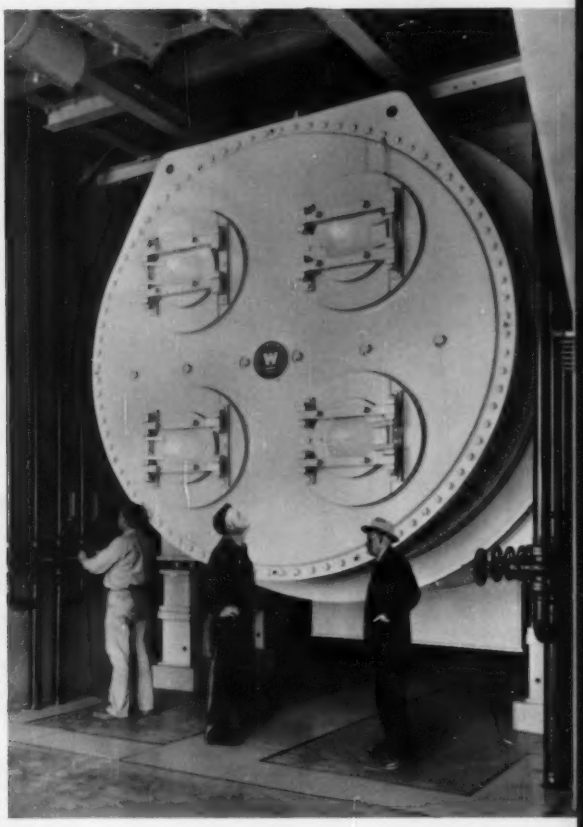
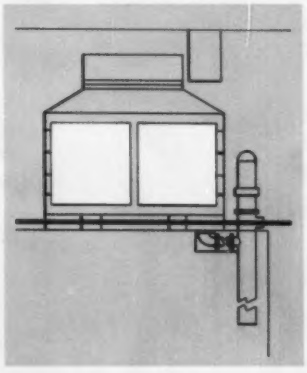
# Westinghouse

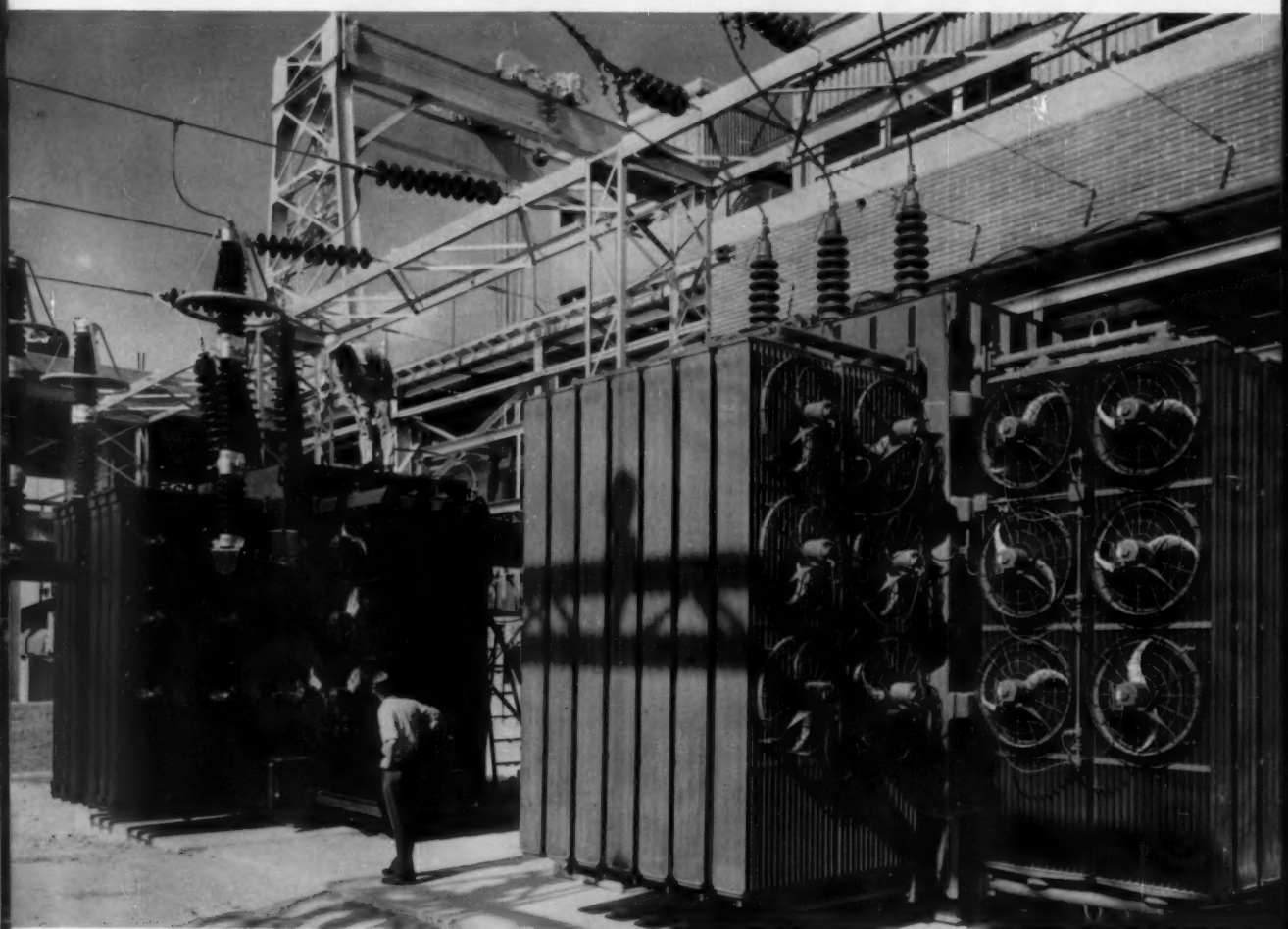


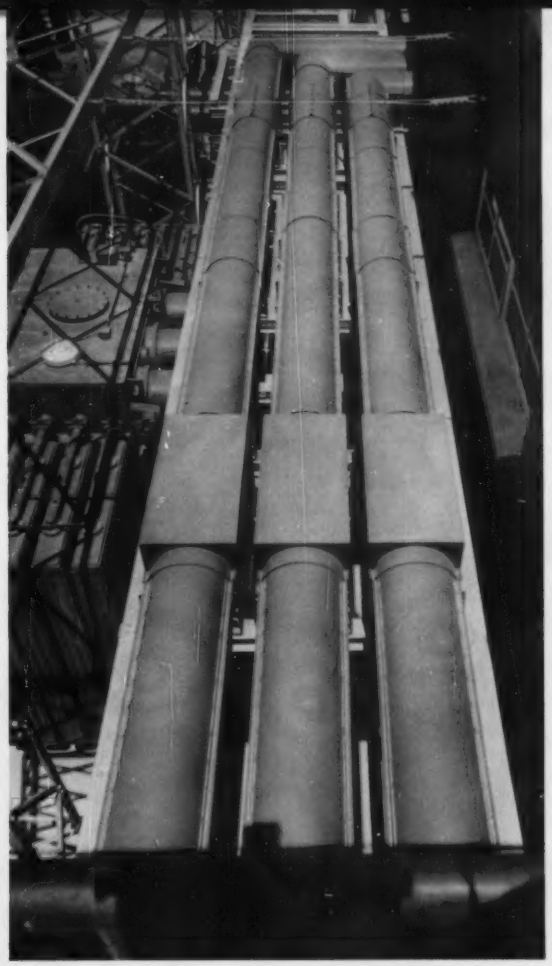
Garland Ratcliff (left) Westinghouse Erection Engineer assigned to the building of Person Station, checks over No. 3 condenser with H. H. Finch, Superintendent of Plants, Public Service Company of New Mexico. In the background, Marvin Branson takes a temperature reading on the hydrogen coolers. The condenser for Reeves Station, now under construction, will be of the newer Westinghouse rectangular design which offers a number of advantages for fast installation. In addition, with its two compartment radial-flow design and consequent short steam path to center air offtakes, the Westinghouse rectangular condenser provides lowest pressure drop.

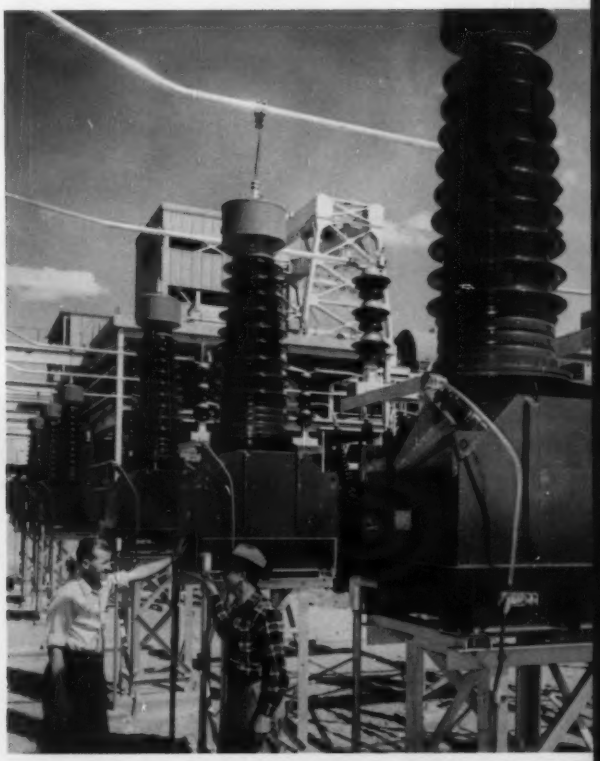


# ALL WESTINGHOUSE SWITCHYARD...MAXIMUM PROTECTION FOR PERSON STATION 115 KV CIRCUITS

ALL FOUR POWER TRANSFORMERS at Person Station are Westinghouse Form-Fit® design. Transformers No. 1 and No. 2 are OA/FA, 25,000/33,333 and serving 43,800-volt transmission. Numbers 3 and 4 are OA/FA 33,000/44,000 kva to serve 115,000 volt transmission. They are protected with the new "condensed" Westinghouse arresters with the exclusive pressure relief device. Westinghouse Form-Fit transformer design not only offers appreciable savings in space and weight, but also the all-welded tank design is ideal protection in the battle with sand and dust.

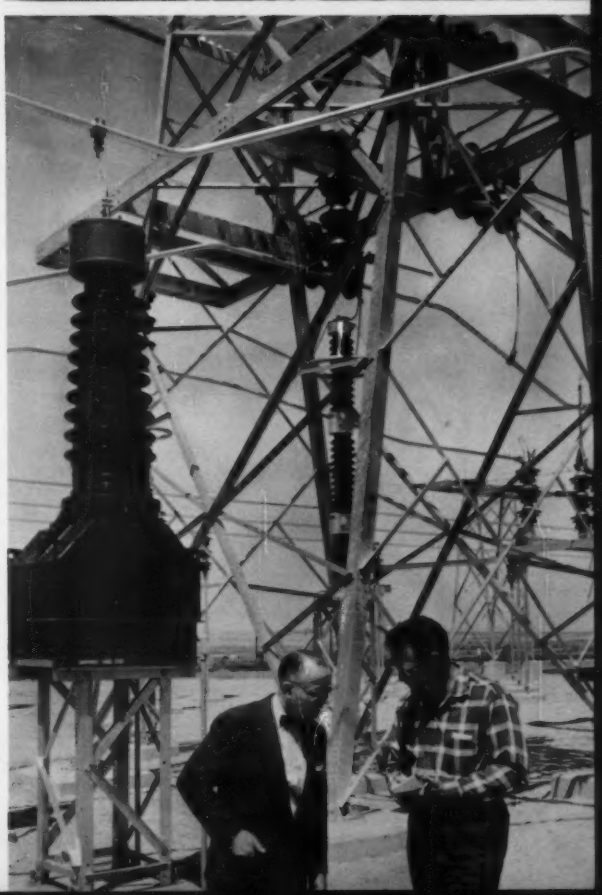






FOR COMPLETE MECHANICAL AND ELECTRICAL PROTECTION, Westinghouse isolated phase bus was selected by Public Service Company of New Mexico to provide a safe, reliable connection between generators and transformers. The complete and individual metal enclosure of all conductors and supporting insulators provides the highest degree of mechanical and electrical protection, insuring complete safety to operating personnel—eliminating maintenance by the use of dust-tight construction.

JOHN HAYS, SUPERINTENDENT of Person Station (above, right) is shown in the switchyard with Guy Schell, Foreman of Electrical Maintenance, discussing the standard Westinghouse potential transformers for metering and relaying on the 115-kv transmission circuits. The "Coastal Finish" applied to these units is a distinct advantage, to withstand not only the blistering sun and grating sand, but also extremes of weather. Below, Walter Dolde, Chief Electrical Engineer, and Merrill Harkness, Senior Electrical Engineer, are shown with the Westinghouse SV station arresters in the background.



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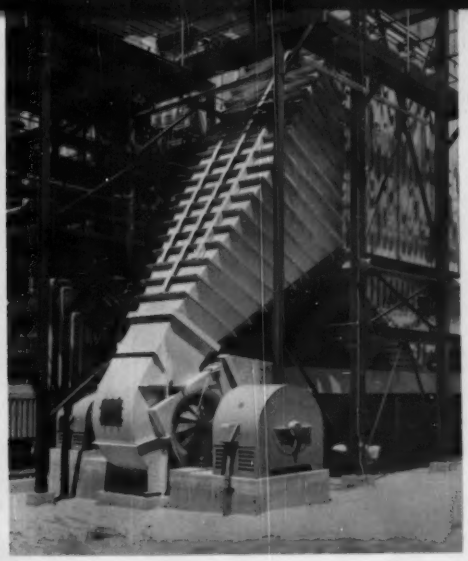
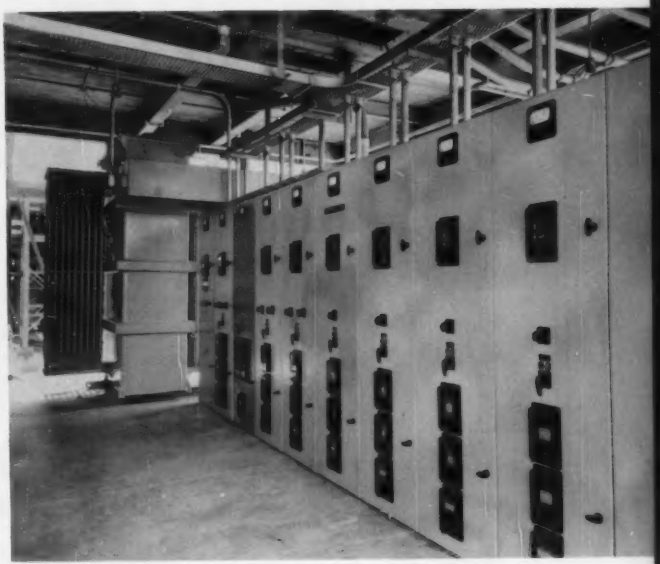
Westinghouse



(Top Left)
30,000 GALLONS OF WATER PER MINUTE are moved from cooling towers to condensers by two Westinghouse centrifugal circulating pumps. They are driven by Westinghouse Powerhouse Motors each rated 350 hp. In addition to the rigorous tests these motors undergo during manufacture to establish their reliability, all Westinghouse Powerhouse Motors are Thermalastic® insulated, for maximum protection in dust-laden atmosphere.

(Top Right)
ONLY FORCED DRAFT FANS ARE REQUIRED, since the boilers at Person Station are fired by gas under pressure. These are Sturtevant® Turbovane® Fans with the exclusive air-foil blade design which has up to 92% mechanical efficiency. These fans are driven by two Westinghouse Weather Protected Powerhouse Motors in tandem, rated 800 hp. and 350 hp.



(Above)
NO. 4 UNIT SUBSTATION . . . this bank of Westinghouse instruments and relays provides the intelligence and protection needed for efficient operation of the utility system. Recording instruments give permanent records of conditions on all lines served by this station. Directional overload protective relays quickly spot and isolate phase and ground faults . . . to provide maximum insurance against equipment damage. The transformer is Westinghouse Inerteen®, OA, 3-phase SL, 2500-kva.

DON POLLARD OF WESTINGHOUSE discusses the new Westinghouse Type GM-5-A power breakers with Guy Schell, Foreman of Electrical Maintenance at Person Station. Pollard is pointing out the advantages of the pneumatic mechanism, both mechanically and electrically trip-free, which gives high speed operation with low control energy. The reliability of this type of mechanism has been proven in over 15 years of field service.

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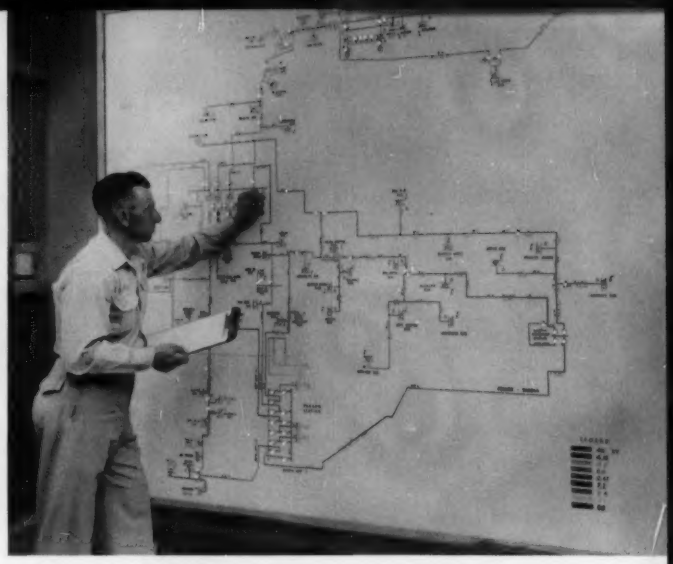
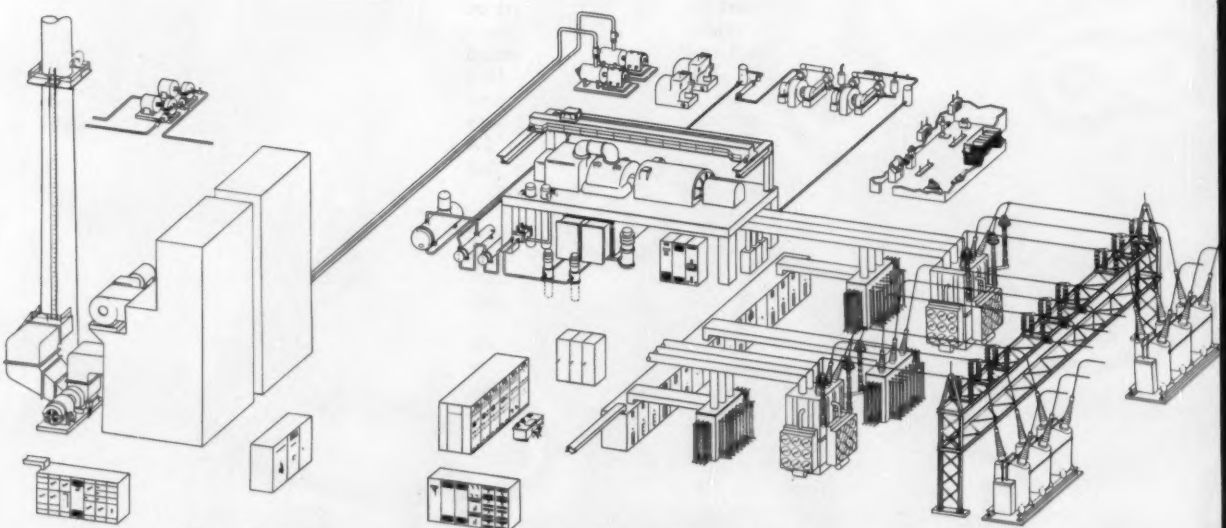
## PERSON STATION... focal point of the Public Service system

The newest and most advanced station, Person Station houses the supervisory control for the entire system. Mervin Lattin, System Operator, is shown at the illuminated system diagram. Lights on this board are a constant reminder to the operator, showing position of all breakers and switches as well as operation of generators. No work crew moves onto any portion of the system without advising him what indication should be shown.



This is an account of how one utility met the challenge of progress and its load demands . . . and how Westinghouse cooperated with engineering, experience and equipment. Your Westinghouse representative can bring you similar assistance. The wide variety of coordinated equipment he is prepared to supply is diagrammed below. Call him for the most complete service available in the industry.

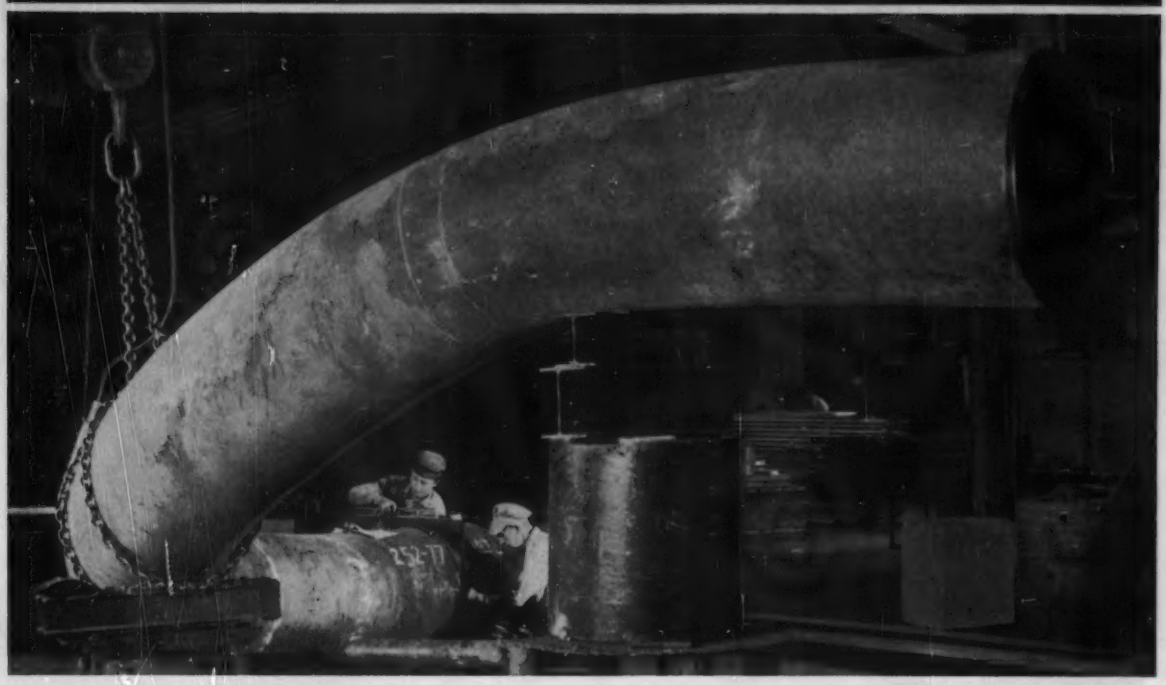
CP-1044



Let Westinghouse coordinate the design, manufacture and delivery of your power station apparatus.

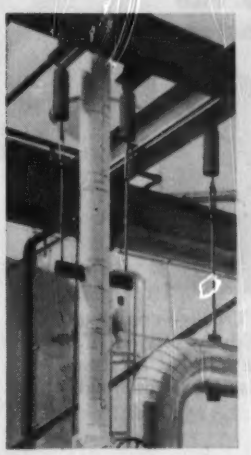
YOU CAN BE SURE... IF IT'S Westinghouse

BLAW-KNOX has what it takes—to provide these products and services



**Large chrome moly pipe being readied for shipment to new generating station.** Making a right angle bend followed by a 24 degree, 18 foot bend in this heavy 27½ inch chrome moly pipe required all the skill and modern facilities of the Blaw-Knox power piping shop. Before shipment, piping is heat-treated and ultrasonically tested with a radar-type device for detection of any defects.

A new Blaw-Knox "6 x 6" Flexibility Matrix Method of computing stresses in power piping systems is now available to consulting engineers, companies, and individuals responsible for the design of power piping systems. By the use of an electronic computer this method cuts calculating time from months to a day; assures full accuracy to six significant figures; and has no limitations on the complexity of the system. Write for further information about our new "6 x 6" Flexibility Matrix Method.



**Two-way control over movement of piping** is provided by Blaw-Knox functional spring hangers with the patented internal swivel action—shown in this modern outdoor generating station. Our experienced engineers are available to both design and make recommendations for your hanger requirements. To get full information, write for Catalog No. 54.

**Each year serious fire strikes one out of every seven** manufacturing firms in this country. Be safe. Let a Blaw-Knox fire-protection engineer study your needs —and explain how you can pay for the system on our lease or deferred payment plan. To get more information send for Bulletin No. 2426—"Fire Can Destroy Your Business."

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*Power Piping and Sprinkler Division*

*829 Beaver Avenue • Pittsburgh 33, Pennsylvania*

**Complete facilities for prefabrication and erection of piping systems for all pressures and temperatures**
**... complete line of standard and custom-engineered pipe hangers, supports and vibration eliminators**
**... complete line of automatic sprinkler systems for standard and special hazards**

## Wagner replacement core and coils come ready to install in your old tanks...

*fully tested....thoroughly dried....packed in oil!*

Obsolete or burned-out transformers needn't be consigned to the scrap heap. With Wagner Form W Core and Coil Replacement Assemblies, these transformers can be made good as new again... *and up-rated at the same time* because the new preformed cores are considerably smaller than the old cores. These packaged replacement core and coil assemblies are factory-new elements, exactly like those used in new Wagner Transformers.

They come to you fully dried and tested—ready for use—protected in a sealed container filled with Wagner 7-NI inhibited transformer oil which you may also use in your tank. They are available in ratings from 3 through 167 kva.

Installation is easy... the assemblies are complete with terminal board or tap changer, with leads ready to install in your tank. Each assembly has a new serial number and name plate.

### Wagner Bushing Assemblies

**High Voltage Bushing Assembly**

Available in cover-mounted or tank wall mounted types to meet a wide range of requirements. Gasket, solderless connector-type terminal and clamping devices are included—fuses can be furnished when specified.

**Low Voltage Bushing Assembly**

Ready to install—includes porcelain bushing, gasket, solderless connector-type terminal and clamping device.

### Field Repair Service for Substation Transformers

Wagner's Transformer Service Trucks—completely equipped for field repairs—each with the services of an expert—are available on schedule in most localities. The cost of this exclusive Wagner service is nominal—write for information.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

**Wagner Electric Corporation**
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

*ANOTHER REASON WHY UTILITIES EXPECT MORE FROM*

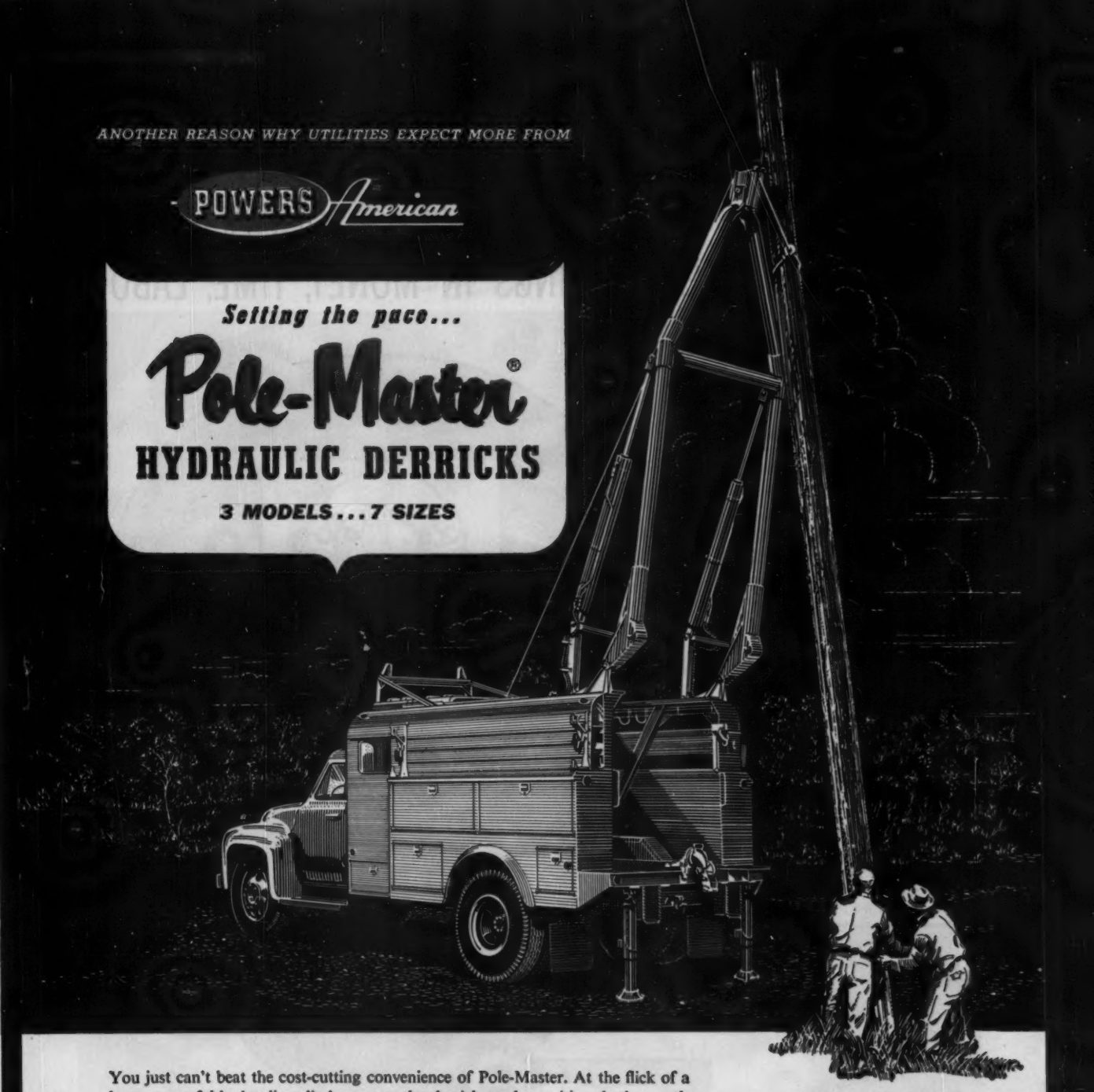
POWERS *American*

***Setting the pace...***

# Pole-Master®

## HYDRAULIC DERRICKS

***3 MODELS... 7 SIZES***



You just can't beat the cost-cutting convenience of Pole-Master. At the flick of a lever, powerful hydraulic cylinders move the derrick to the position that's *exactly* right for the hoisting job. There's no exposed mechanism. Head sheave can be threaded from the ground.

When it comes to capacity, Pole-Master equals or surpasses conventional derricks of comparable rating. It stows *above* the body... never obstructs valuable cargo area space.

Aren't these the features you've long wanted in a derrick for your job?

**The powerful Series PM-2 Pole-Master, shown above on a Powers-American Series 800-C Line Body, is available in sizes for handling 40', 55', and 70' poles.**

**DESCRIPTIVE LITERATURE ...plus complete price information IS YOURS FOR THE ASKING!**

## McCABE-POWERS AUTO BODY COMPANY

5900 NO. BROADWAY • ST. LOUIS 15, MO.

625 CEDAR ST. • BERKELEY 10, CALIF.

Series HD-2 Pole-Master Derricks can be furnished in sizes for handling 40' and 55' poles.

The Series HD-4 Pole-Master, actuated by four hydraulic cylinders, handles 55' and 70' poles.

Powers-American conventional derricks, tripod or T-type, are available in all sizes and capacities.

# DUAL VOLTAGE transformers

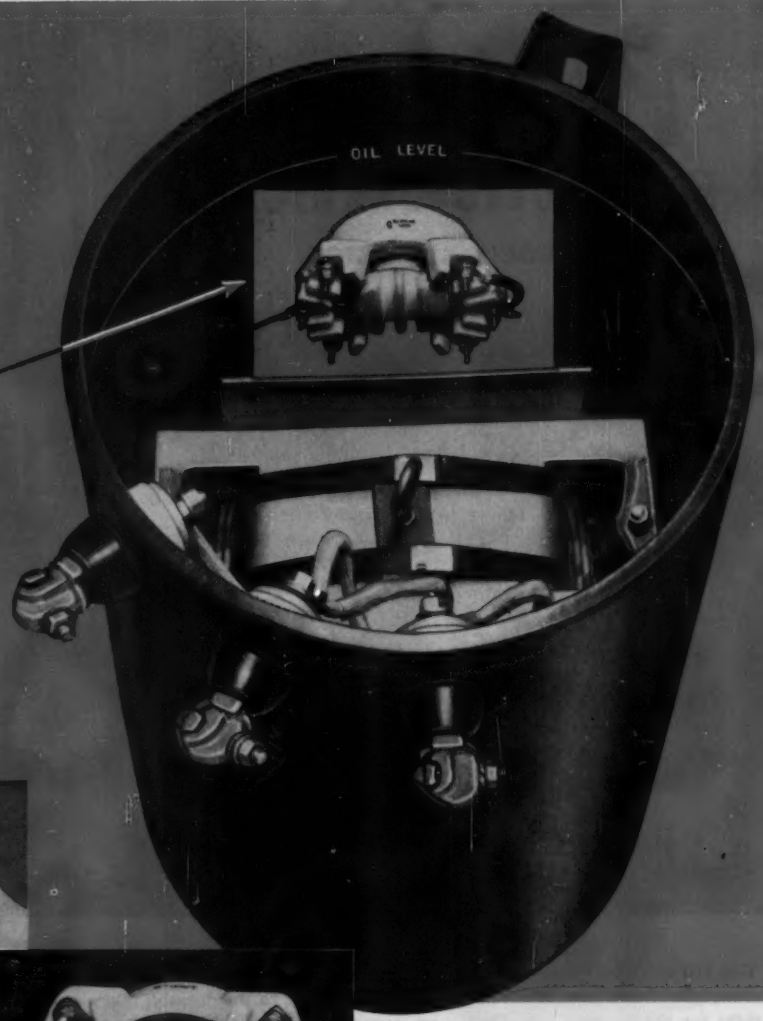
## MEAN SAVINGS IN MONEY, TIME, LABOR

**You save in stocking requirements . . . one unit can be stocked where it now takes two.**

**You save transformers from obsolescence when system voltage is increased.**

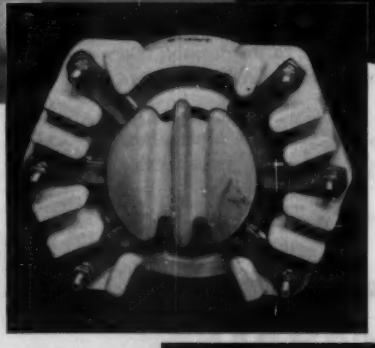
**You save on change-over, cutting both down time and labor time.**

**Voltage change-over switch is mounted on the inside of the tank, under the oil level. It is fully operable from outside the tank.**




**Switch is sealed and protected from damage by removable screw cap and neoprene gasket.**

**Simple operation! Remove screw cap and reverse, using cap as handle for rotating switch.**



**Switch is rotary-bridging-to-position type, with both positions clearly identified by a stamped plate on the switch. Body constructed of wet process electrical porcelain with ample creepage. Fully impulse tested by NEMA standards.**

**For positive protection against puncture, flashover, or lightning failure the entire transformer is always insulated for the basic insulation level of the highest name plate voltage.**

| | | |
|---|---|---|
| **Available in** | **2400 x 4800 volt**<br>**2400 x 7200 volt**<br>**4800 x 14,400 volt**<br>**7200 x 14,400 volt** | **from 10 through 100 KVA.** |

Like all RTE Transformers, dual voltage models are backed by a five year guarantee. They are available from conveniently located warehouses throughout the U.S.

**HELPING PROVIDE POWER FOR AMERICA**

**RT&E CORPORATION**
**WAUKESHA, WISCONSIN**

E.F. Luna: ~~Please note and return~~

# ELECTRICAL TESTING LABORATORIES, INC.

2 EAST END AVENUE, NEW YORK 21
BUTTERFIELD 8-2600

TESTING • INSPECTIONS • CERTIFICATION

ELECTRICAL • PHYSICAL • CHEMICAL

July 17, 1957.

Mr. E.L. Gittleson,
Manager of Quality Control
Anaconda Wire & Cable Company
Hastings-on-Hudson 6, New York

Dear Mr. Gittleson:

Herewith is our Summary Report No. 366064 for 1956-1957, which brings together the results of the services we have rendered to your Company in this thirteenth contract year under your Quality Maintenance Program. As usual, our service covered your seven plants from coast to coast and consisted of the following:

1. Check or "audit" of inspection records at each plant, with results of some 121,500 tests examined. As in other years, every evidence that substandard material was rejected and so labelled, while only material in full compliance with relevant specifications went to the shipping room.

2. Witness of testing operations in each plant, with no criticism of technique, procedure or applicability of specification. As a "double check" -

3. Specimens of products on which plant tests had been witnessed were shipped to our headquarters and tests made there by our personnel, with our equipment and our interpretation of specifications; result, satisfactory agreement.

4. Calibration of all testing apparatus in the seven plants using ETL standards throughout. 352 pieces of testing equipment, some with as many as 5 ranges each, were checked; our certificate reports covered 366 pages. A fresh "ETL" red label was attached to each to indicate compliance with the accepted accuracy limits.

To summarize in one sentence: All of this checking by ETL furnishes once more, evidence of the effectiveness of your in-plant Quality Maintenance Program to insure that the products shipped are in full compliance with the relevant specifications.

Very truly yours,

Gordon Thompson

Gordon Thompson,
Chief Engineer.

GT/eg

E.L.G. Thanks - This certainly confirms that Anaconda Wire and Cable is made under the strictest quality control program in the industry

E.F.L

NOTE: E T L REPORTS ARE THE PROPERTY OF THE CLIENTS TO WHOM THEY ARE RENDERED. ... REPRESENTATIVE CHARACTER OF THE SAMPLES AND TO THE COMPREHENDIVENESS OF THE TESTS. ... QUOTATIONS FROM E T L REPORTS ARE AUTHORIZED ONLY SUBJECT TO E ...

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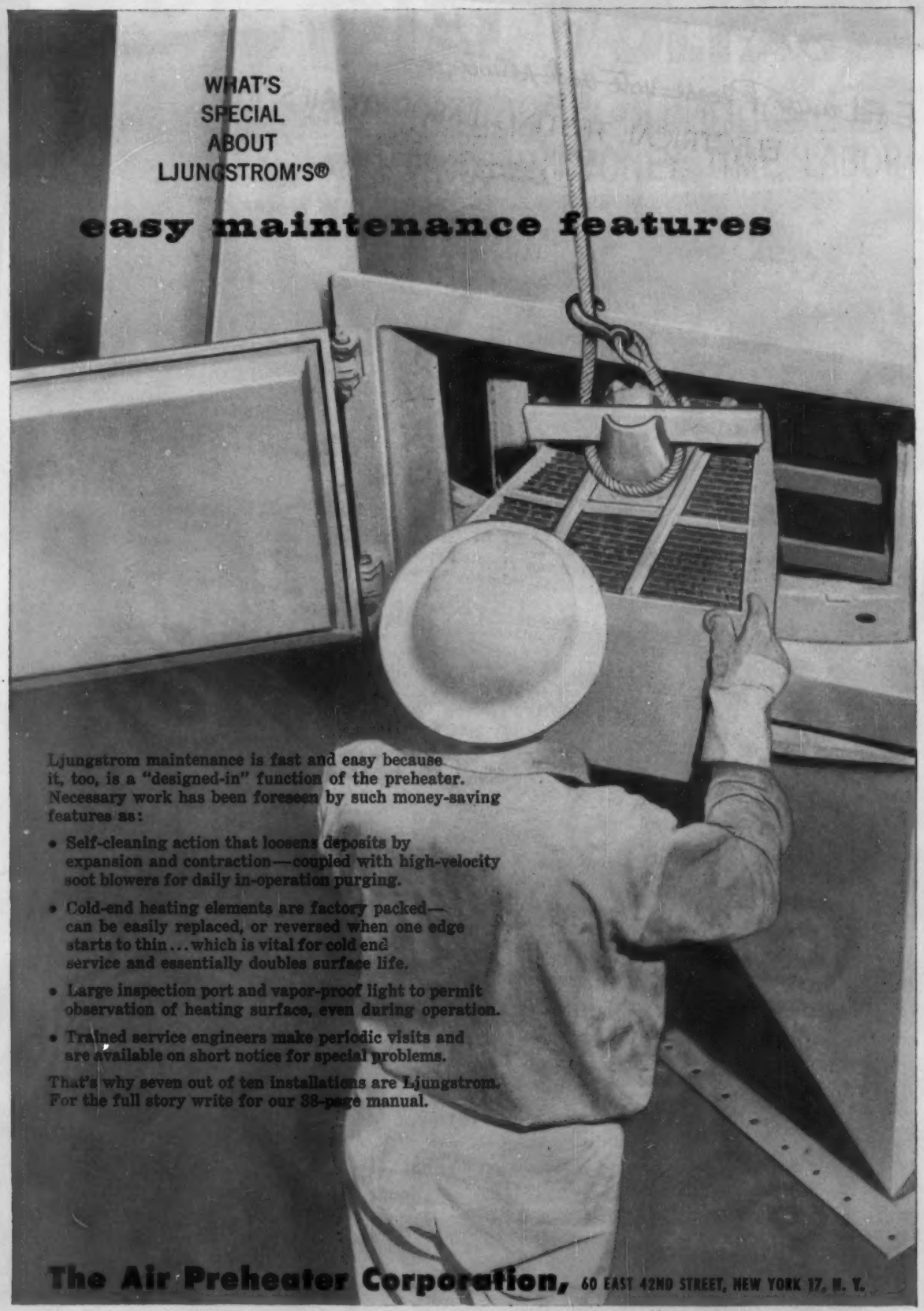
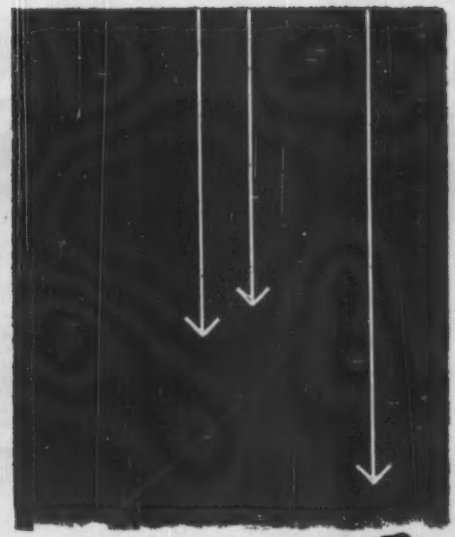
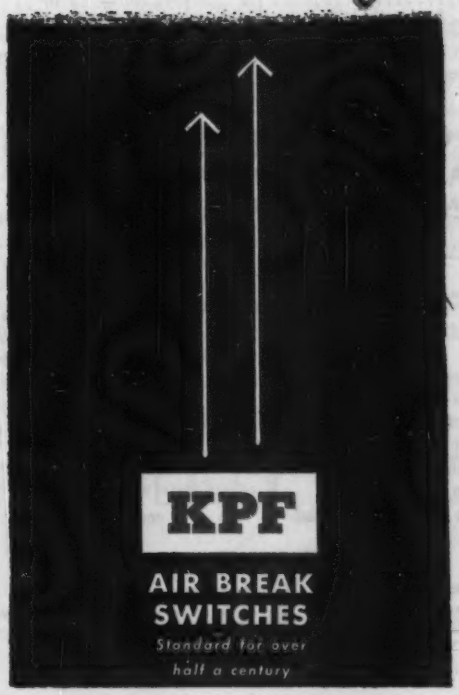

WHAT'S
SPECIAL
ABOUT
LJUNGSTROM'S®
easy maintenance features
Ljungstrom maintenance is fast and easy because it, too, is a "designed-in" function of the preheater. Necessary work has been foreseen by such money-saving features as:
• Self-cleaning action that loosens deposits by expansion and contraction—coupled with high-velocity soot blowers for daily in-operation purging.
• Cold-end heating elements are factory packed—can be easily replaced, or reversed when one edge starts to thin... which is vital for cold end service and essentially doubles surface life.
• Large inspection port and vapor-proof light to permit observation of heating surface, even during operation.
• Trained service engineers make periodic visits and are available on short notice for special problems.
That's why seven out of ten installations are Ljungstrom. For the full story write for our 38-page manual.
The Air Preheater Corporation, 60 EAST 42ND STREET, NEW YORK 17, N. Y.



# Only KPF switches look like this

**simple, attractive, trouble-free, proved in 50 years service**

*..... Original "straight-through" design .....*



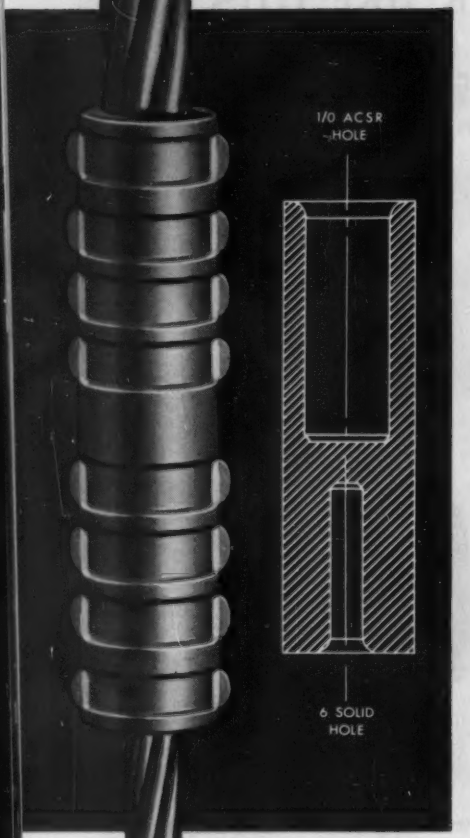

You always know when a power company is using KPF switches. (As more and more are today). You can't miss the clean, functional "straight-through" appearance of KPF phase units. This same design simplicity that produces pleasing pole top appearance also insures all-weather operating ease. KPF switches have no temperamental mechanisms to malfunction, freeze, lock, need lubrication or wear out.

KPF switches have proved their dependability in over 50 years service on major utilities. Make a test installation of the original, "straight-through" air break switch on your system this month.

Write direct for catalog.

**KPF ELECTRIC COMPANY**
Dept. E. 1624 E. Alpine Avenue
Stockton 5, California

# You get HIGHER CONDUCTIVITY with BLACKBURN SERVICE ENTRANCE SLEEVES




## because Blackburn... and Blackburn alone... provides GREATER CONTACT AREA where needed

**Hole Depth Increases With Size of Conductor... thereby providing more contact area for the conductors being connected.**

| COLOR CODE | WIRE SIZE ACSR | WIRE SIZE AWG | HOLE DEPTH IN INCHES |
|---|---|---|---|
| Brown | – | 8 sol — 10 str | .820 |
| Green | – | 6 sol — 8 str | .840 |
| Blue | 6 | 4 sol — 6 str | .860 |
| Orange | 4 | 2 sol — 4 str | .925 |
| Red | 2 | 1 sol — 2 str | 1.010 |
| Yellow | 1/o | 1/o str | 1.185 |

The center stop in a Blackburn Sleeve is a solid barrier that assures proper distribution of the inhibitor around the conductors.

**FIRST!** Printed (not indented) permanent COLOR CODING *is easier to read*—makes size identification positive and quick.

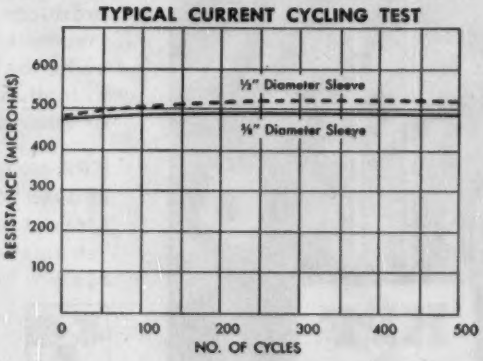
**FIRST!** Aluminum Sensitized Tape seals the Blackburn Sleeve's ends. Easy to puncture... and, if a particle of the seal is pushed into the chamber, it is conductive.

**FIRST!** Each Blackburn Sleeve contains the superior Blackburn inhibitor, Contax, *in measured amount.* Won't squirt out on glove or in face.

LIVE BETTER ELECTRICALLY

## Conductivity of Connection PROVED GREATER Than Equivalent Length of The Conductors Being Connected.

TYPICAL CURRENT CYCLING TEST




A series of typical current cycling tests were conducted with both ½" x ⅜" diameter BLACKBURN Sleeves. Note the lower resistance of Blackburn Sleeves as compared to the equivalent length of cable without any sleeve.

**Test Conditions**

Wire: 2 ACSR to 4 stranded copper
Current: 190 Amperes
Cycle: 2 Hrs. "On" 1 Hr. "Off"
Length of Connection: 24 inches
Curves represent an average of five tests
Resistance of equivalent length of wire: 527 Microhms

**JASPER BLACKBURN CORPORATION,** 1525 Woodson Rd., St. Louis 14, Mo. • WYdown 3-9430

# AUSTIN-WESTERN HYDRAULIC CRANE

A-W crane hoisting tank inside Brunot Island Power Station. Machine's 4-wheel steer gives the maneuverability needed for working in cramped quarters like this.

## A-W crane reduces labor costs on powerhouse maintenance jobs in Duquesne Light plant

Company engineers at Brunot Island Power Station, Pittsburgh, Pa., report: The A-W hydraulic crane has become a puller, lifter, carrier, positioner, digger, and jack-of-all-trades.

Before purchase of the A-W crane, a 20-ton overhead crane handled all the lifts made during a major overhaul of powerhouse equipment. Now the A-W handles all the smaller lifts, carries parts to repair locations, and positions them for reassembly. This leaves the big crane free for heavy lifts and reduces the delays.

The two cranes often work as a team. For example, the large crane lifts the main cover of a turbine and holds it while the A-W moves in to lift out the bearing blocks and other smaller parts. This teamwork cuts the handling time considerably on major overhauls and reduces outage. As a result, direct maintenance costs are lower, and the useful production time of the generating equipment is increased.

The A-W crane does many other jobs, too. Used to handle incoming chlorine tanks, it has saved many manhours per carload. It positions and turns large water screens, weighing up to 3 tons each, when they are sandblasted and repainted. It handles scrap metal and is even used for such unlikely jobs as digging ditches and loosening large studs from turbines and generators.

Get the full story on the A-W hydraulic crane at Duquesne Light Company.

*Fill out and mail the coupon today*

AUSTIN-WESTERN WORKS
666 Farnsworth Avenue, Aurora, Ill.
Please send me the complete report on the A-W hydraulic crane at Duquesne Light Company.

Name .....
Title .....
Company .....
Street .....
City ..... Zone ..... State .....

Power graders • Motor sweepers • Road rollers • Hydraulic cranes

BALDWIN BLH LIMA-HAMILTON

AUSTIN-WESTERN WORKS
BALDWIN-LIMA-HAMILTON
Construction Equipment Division
OTHER DIVISIONS: Eddystone • Lima • Electronics & Instrumentation • Hamilton • Loewy-Hydropress • Standard Steel Works • Madsen • Pelton
AURORA, ILLINOIS, U.S.A.

"We like the convenient storage characteristics of POC Bushings ---no special procedure or special handling is required."

"These totally-enclosed oil-filled bushings for lower voltages will surely create a trend."

"THE CADILLAC OF BUSHINGS!"

"We gave it more severe tests than any other bushing we ever tested --- and we approve it without modification or alteration."

"Excellent Design!"

"AN EXCELLENT DESIGN, AND MANUFACTURED IN THE BEST OF FACILITIES."

"An ideal design, and well-suited to applications where existing bushings cannot be used."

"A superior bushing, but we'd expect nothing less from Lapp."

"Seems to be an excellent bushing; we can find no faults whatever."

**APPROVED and ACCEPTED**

# Lapp POC* BUSHING

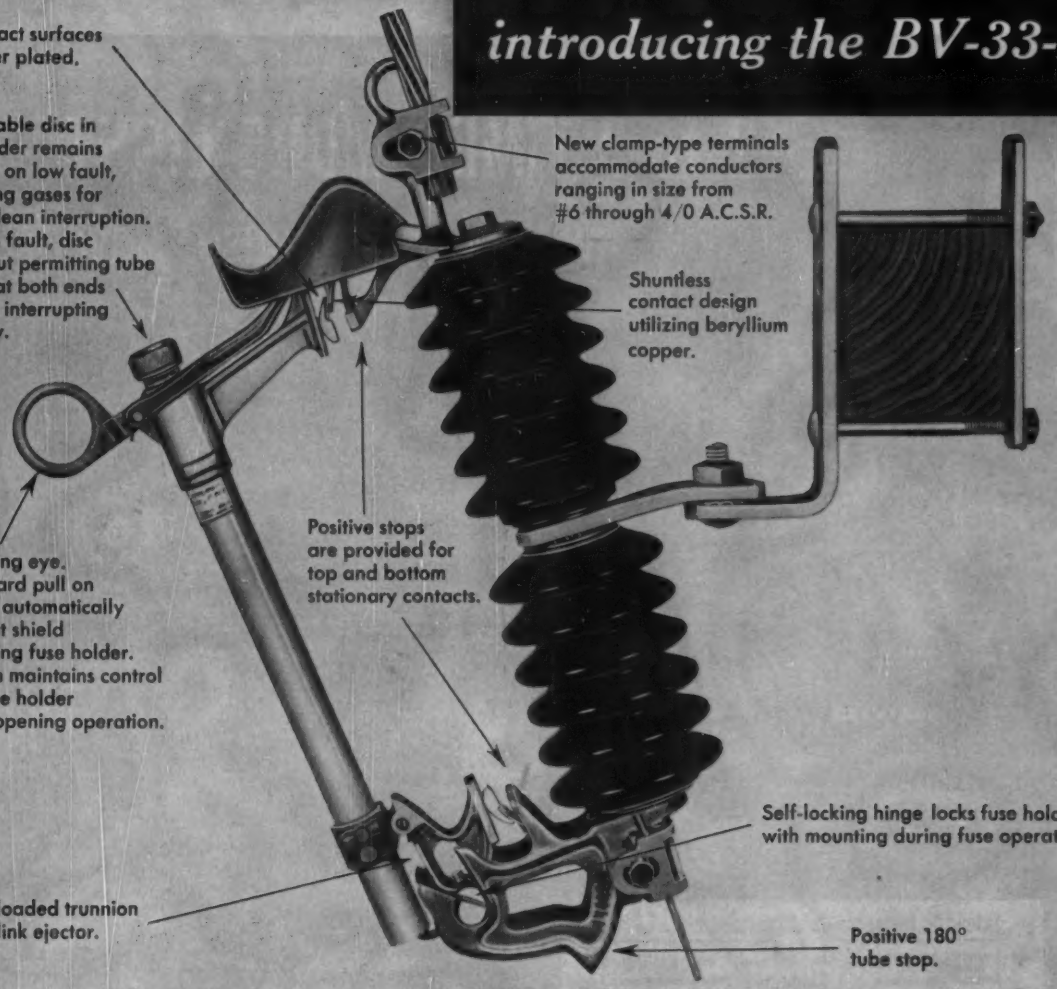
*PAPER-OIL CONDENSER TYPE TOTALLY-ENCLOSED CORE ASA STANDARD

In its first six months after announcement, the Lapp POC* Bushing has won the enthusiastic endorsement of utility engineers and equipment manufacturers from coast to coast. Rigorous characteristic and performance tests have been conducted in customer laboratories or in the Lapp laboratory under customer supervision. Practically every utility and every equipment manufacturer who have seen this bushing have placed it on Approved or Standards Lists—or tell us they are in process of approving it.

Lapp POC* is the bushing design of the future —ready to serve you reliably today.

Lapp Insulator Co., Inc., Le Roy, N. Y.

*introducing the BV-33-F*


All contact surfaces are silver plated.
Expendable disc in fuse holder remains in place on low fault, restricting gases for quick, clean interruption. On high fault, disc blows out permitting tube to vent at both ends for high interrupting capacity.
New clamp-type terminals accommodate conductors ranging in size from #6 through 4/0 A.C.S.R.
Shuntless contact design utilizing beryllium copper.
Positive stops are provided for top and bottom stationary contacts.
Operating eye. Downward pull on this eye automatically lifts sleet shield unlatching fuse holder. Lineman maintains control over fuse holder during opening operation.
Self-locking hinge locks fuse holder with mounting during fuse operation.
Spring-loaded trunnion acts as link ejector.
Positive 180° tube stop.

# A Powerful New Southern States Cutout For Handling Restricted or Heavy Faults

CHECK THE FEATURES of the powerful new BV-33-F! Whether you are a lineman, or an engineer responsible for applying cutouts on an entire system, we believe the BV-33-F will meet your requirements.

Despite its exceptionally high interrupting rating the BV-33-F clears restricted faults quickly and cleanly. Secret of its success on faults of any magnitude lies in the expendable disc in the fuse holder cap. On low faults the disc remains in place, restricting gases within the tube for maximum arc-quenching ability. On high faults the disc blows out and the cutout double-vents for maximum interrupting capacity.

The BV-33-F can be easily converted to a single-vented SV-33-F by replacing the pressure relieving cap with a solid cap.

For additional information on these new cutouts contact your local Southern States representative.

**CHECK THESE INTERRUPTING RATINGS**

| KV | Continuous Current Amps | Interrupting Capacity RMS Amps |
|---|---|---|
| **TYPE BV-33-F** | | |
| 5 | 100 | 8,000 |
| 7.5 | 100 | 8,000 |
| 15 | 100 | 6,000 |
| 25 | 100 | 4,000 |
| **TYPE BV-33-FH** | | |
| 5 | 100 | 10,000 |
| 5 | 200 | 10,000 |
| 7.5 | 100 | 10,000 |
| 7.5 | 200 | 10,000 |
| 15 | 100 | 8,000 |
| 15 | 200 | 8,000 |
| 25 | 100 | 5,000 |

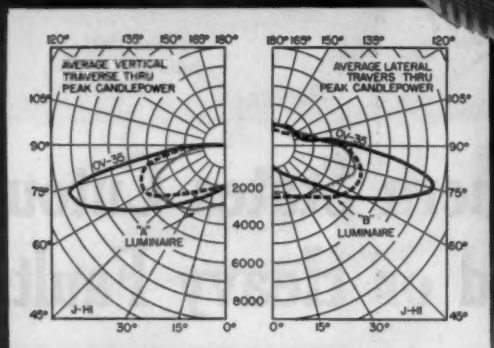
IN CANADA: Dominion Cutout Co., Ltd., Toronto

**SOUTHERN STATES**
**EQUIPMENT CORP.**
HAMPTON, GEORGIA

# 2 to 3 TIMES MORE LIGHT—at

## with Westinghouse, Advanced-

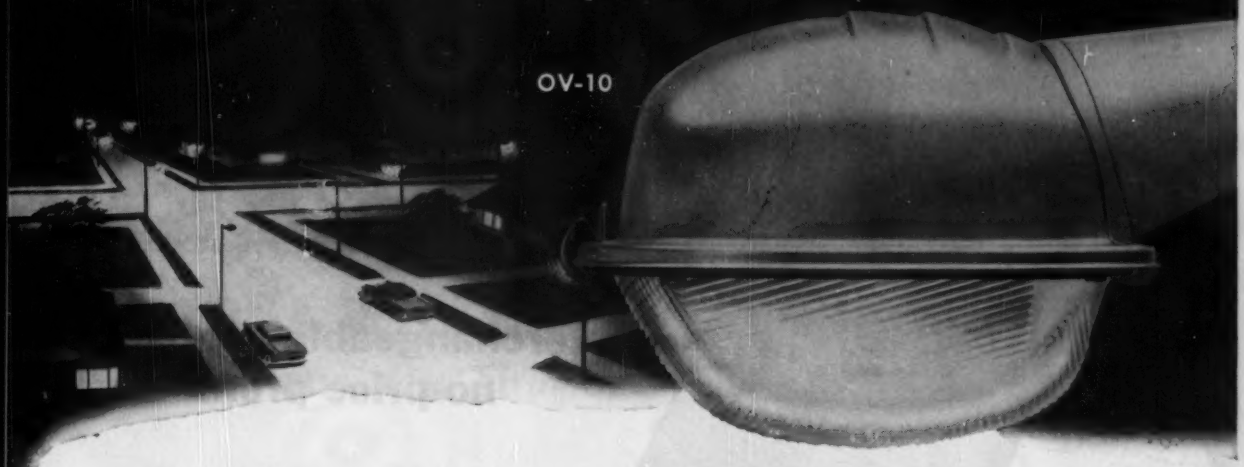
OV-35




**See how OV-35 produces "practically twice" the candlepower of luminaires not designed specifically for fluorescent mercury lamps!**

OV-35 candlepower curve is from J-H1 400 W color-improved lamp (OV-35 also utilizes B-H17 430W and B-H18 700 W lamps). Note how curves for A and B luminaires (designed *only* for *plain* mercury lamps) show *"practically half" the candlepower* when tested with the *identical lamp employed to produce the OV-35 curve!*

# NO APPRECIABLE INCREASED COST!- type MERCURY LUMINAIRES!




## OV-35 THE ONLY "Mainstreet" Luminaire Engineered and Designed Specifically for color-improved Fluorescent Mercury Lamps!

"Mainstreet" lighting is now accomplished at *new peaks* of lighting efficiency! Yet at *negligible, if any,* increased operating cost!

This is due to exclusive Westinghouse developments now permitting OV-35 Luminaires to deliver *full* advantage of *color-improved Mercury lamps!*

It's well-known that *mercury* light-sources give up to *three times more light per watt* (than old-fashioned light-sources)! And also *out-last* old-style lamps by as much as *seven times!*

So, now Westinghouse, *alone,* has engineered the OV-35 Luminaire *specifically for* these superior mercury lamps—the OV-35, featuring an *exclusive, sealed* optical system, that *keeps out* bugs and water—and delivers this *greater* illumination, with *unparalleled* efficiency, *directly onto the road-way!*

This OV-35 has a housing of cast aluminum—a special glass refractor of *custom prismatic* design!—a reflector of Alzak Processed drawn aluminum.

Its slip-fitter provides quick, easy mounting and adjustable alignment. Its automatic latch permits fast, "one-hand" maintenance. Yet the seal is *tight* on *special* gaskets! The OV-35 is moisture-*proof* and bug-*proof!* This OV-35 *itself* is accredited for *many* of the advancements in modern "mainstreet" lighting today!

## OV-10 Now Brings the Same, Ideal-type Illumination to Residential Streets!

The OV-10 has been engineered identically, to complement the famed Mercury Lighting Line of Westinghouse OV Luminaires, *preferred* by *most* street-lighting engineers!

The OV-10 delivers the same "*2-to-3-times-more-light*" and the *same* extraordinary *economy* for the proper lighting levels of *secondary streets!*

The OV-10 utilizes L-H4 100 W, A-H22 175 W and C-H5 250 W lamps. It has, in general, the same marked design and construction superiorities of all Westinghouse street-lighting luminaires. One simple move of the socket gives a choice of light-distribution to suit illumination requirements for virtually *any* secondary street!

**All Westinghouse OV Luminaires are available now!**

through your near-by Westinghouse Representative, or your own local Westinghouse Distributor! J-04423

---

**WESTINGHOUSE LEADS ALL OTHERS IN THE ENGINEERING, DESIGN AND DEVELOPMENT OF MERCURY ILLUMINATION FOR ALL ROADWAY LIGHTING APPLICATIONS!**

YOU CAN BE SURE...IF IT'S

Westinghouse

**OV-20 LUMINAIRE** (E-H1 & J-H1 400W; A-H24 & B-H24 430W lamps)

**OV-60 LUMINAIRE** (A-H18 & B-H18 700W; A-H15 & B-H15 1000W lamps)

# STATION QUALITY

# for your

Dynagap element and magnetic arc-control coils — heart of new Thorex arresters, and used interchangeably in all classes. For the first time, this brings many factors of station grade protection to the distribution field, and amounts to a radical up-grading of distribution performance. In this gap element, having only slightly more than three cubic inches volume, the 60-cycle power follow arc is stretched 33 inches—more than five times the arc length per kv ever previously attained. The resulting high arc resistance imparts valve action to the gap element and relieves valve blocks of a major share of arc-extinction. With this restriction removed, highly advantageous improvements in valve block functions have been made. This is a basic departure from traditional lightning arrester practice, and constitutes a fresh approach geared to modern system requirements.

## Interchangeable protective no price premium . . .

The new Thorex Dynagap lightning arrester protective element is so compact it will fit distribution models, and still permit making the smallest size arrester of its type — at the same time, so rugged and efficient that it brings a new high order of durability and protection to the heaviest duty station class equipment — *the identical Dynagap!*

In the distribution field, Thorex Dynagap lightning arresters are equally effective on lightly-loaded lines — on long, "stringy" circuits — with under-sized conductor — or, conversely, right next to a generating station or other large source of central power. Subsequent changes in line load or capacity do not affect it. The arrester cannot be overtaxed by any predictable distribution requirements yet, with this ruggedness, it is a precision device. In every spot on a distribution system, the new Thorex Dynagap arrester adds both sensitivity and durability to the finest quality of basic protection. Price is comparable to other equipment.

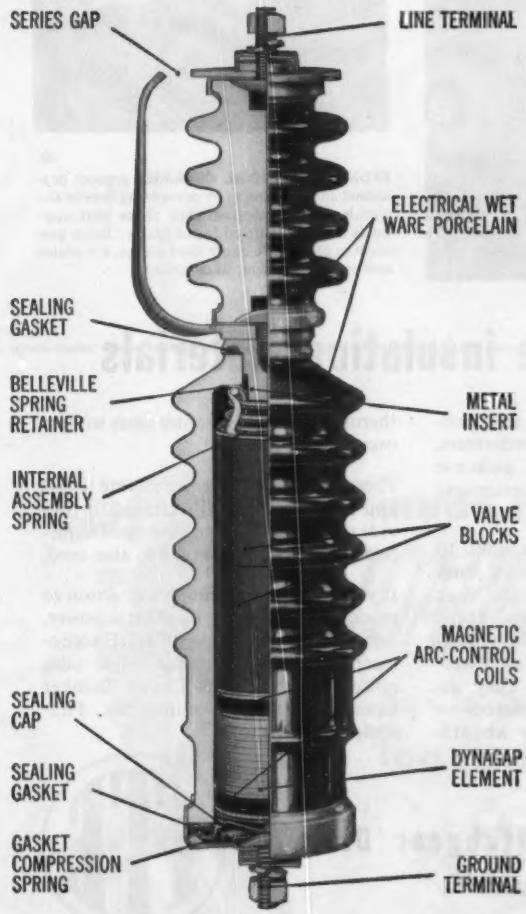
Only in Dynagap design is there interchangeability of vital protective elements between all classes of arresters. Therefore, only in the Dynagap, do you get many basic elements of station protection on your distribution system.

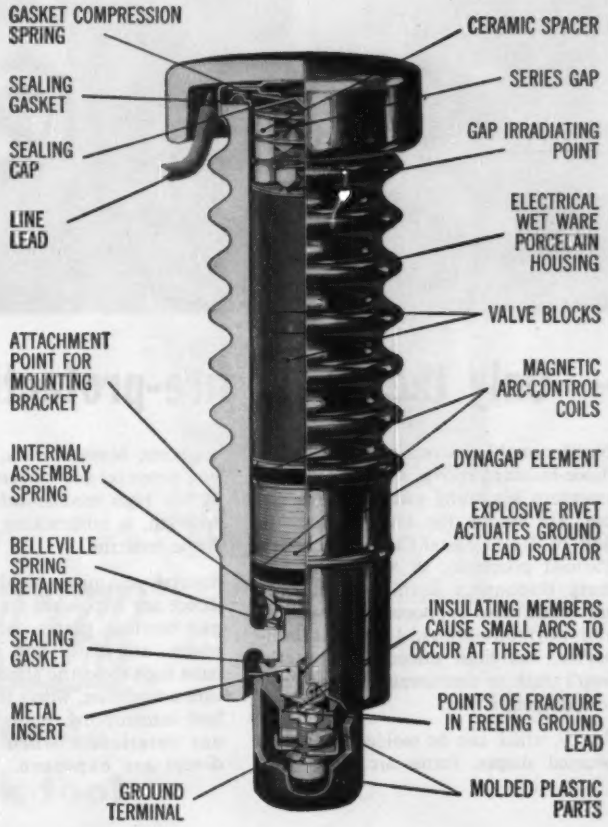
OHIO BRASS COMPANY • MANSFIELD, OHIO

# arrester protection

# DISTRIBUTION system

## elements between station and distribution classes... typify unique new Thorex Dynagap

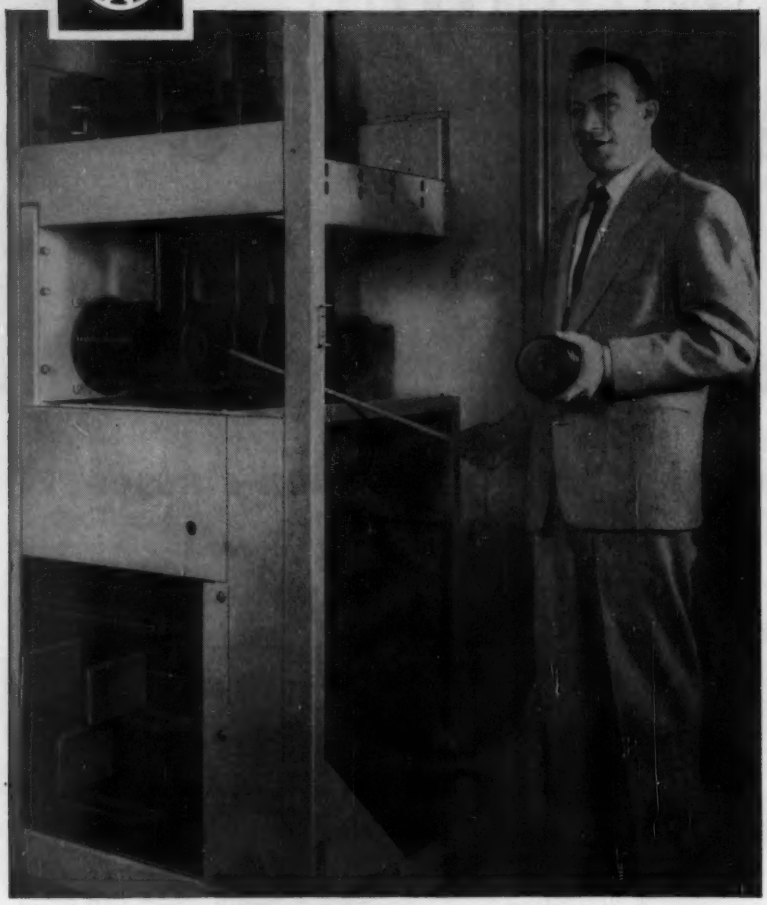


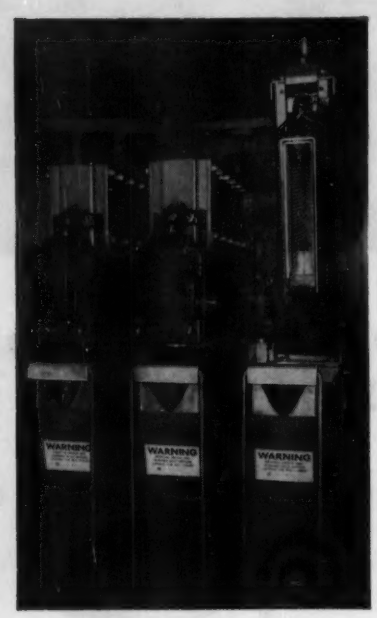

Ohio Brass

4779-H

## METAL-CLAD SWITCHGEAR



**PURIFIED PORCELAIN** in horizontal and vertical bus supports, primary disconnect bushings and caps and epoxy in bus joint covers provide excellent insulation, prevent fires in 15 kv I-T-E metal-clad switchgear. ◀




▲ **EPOXY AND SPECIAL CERAMICS** protect personnel and equipment by preventing fires in the circuit breaker section. Arc chute rear supports and blowout coils are epoxy. Jump gap cooling plates, arc chute liner plates, arc plates and spacers are special ceramics.

# Only the finest fire-protective insulating materials

Nonflammable porcelain and ceramics, flame-resistant epoxy, and other flame-retardant insulating materials throughout, are among the extra values you find in I-T-E Metal-Clad Switchgear. Purified porcelain, of which the primary disconnect bushings and caps are made, also supports both vertical and horizontal bus. It is nonflammable, has high dielectric strength, won't track or deteriorate, is inherently contamination free.

Epoxy, which can be molded into complicated shapes, forms arc chute rear supports, blowout coils, bus joint covers, potential and current transformers. It has high mechanical and dielectric strength, is nontracking and extremely flame resistant.

Special ceramics, highly resistant to direct arc exposure, are used in jump gap cooling plates, arc chute liner plates, arc plates and spacers. These have high dielectric strength, low moisture absorption, won't track, are excellent interrupting materials. They do not deteriorate when subjected to direct arc exposure. They absorb thermal shock and deionize gases without excessive heating.

Phenolic and polyester insulating sheets and moldings, specially treated to provide the highest possible degree of flame-retardant characteristics, are also used.

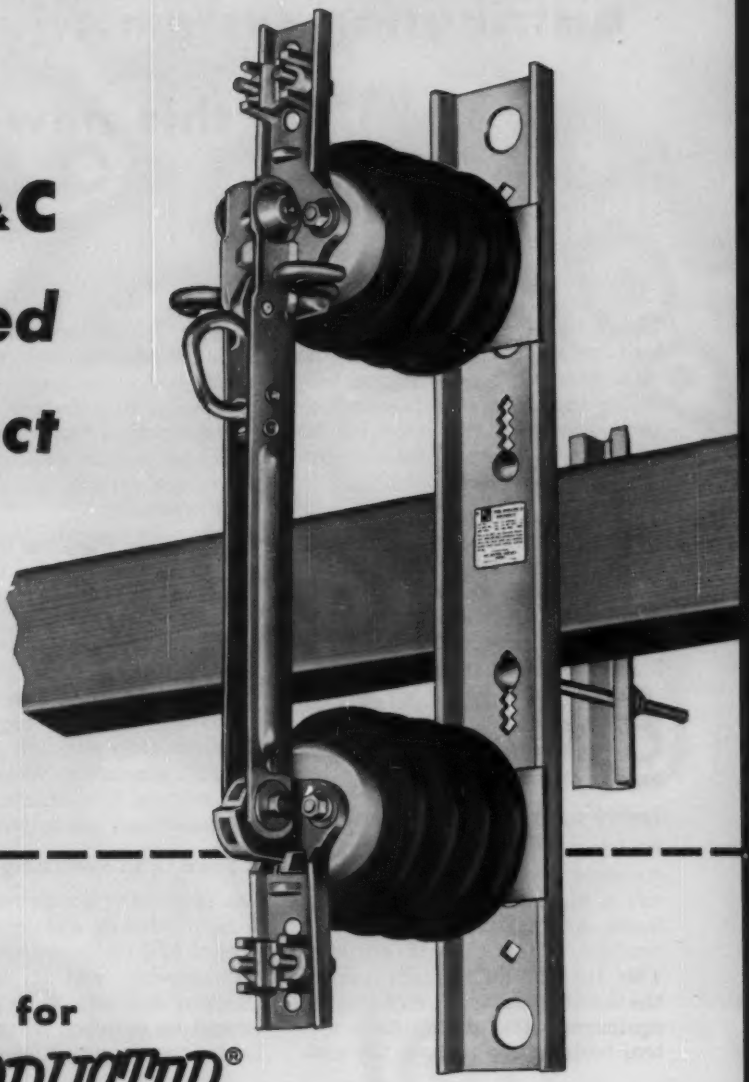
If you are planning new construction or modernization requiring electric power, consider the advantages of I-T-E equipment. Consult your local I-T-E sales office or write I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

**I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division**

IN CANADA: EASTERN POWER DEVICES, LTD.

# HERE!

## the new S&C Tool Operated Disconnect



made for

LOADBUSTER®

S&C's portable loadbreak tool

# NOW! low-cost load switching for your distribution system...just hook Loadbuster® this new S&C Tool Operated

That's right! Now you can make load switching universal. At the same time you get the rugged reliability you'd expect from a station-type disconnect, while paying no more than you would for distribution-type disconnects.

This new S&C Tool Operated Disconnect switches loads dependably with Loadbuster, S&C's portable loadbreak tool, and it is the only distribution disconnect with published short-time ratings and published insulation values.

Why is this published data important? Just take a look at what has been happening on distribution lines in the past few years—

### Today's Disconnect Problem

Performance requirements for disconnects have risen rapidly as a result of higher voltages, 400-ampere loads, and alarming increases in available short-circuit currents. This type of duty might suggest the use of 600-ampere, station-type equipment, but distribution system budgets can't stand the cost.

Yet the job is too heavy for the ordinary distribution disconnect which has inadequate short-time capability, substandard insulation characteristics, insubstantial construction, no load switching potentiality, and extremely limited repetitive capability.

Up until now there has been no device to fill the void—no disconnect suited to a modern, high-reliability, distribution system, yet matching distribution economics. To meet this need, S&C is introducing this Tool Operated Disconnect. It meets the rigorous requirements conventionally filled by group-operated disconnects, hook-operated, station-type disconnects, and conventional load interrupters.

### . . . and Load Switching Needs

Load switching is a serious problem today. Primary distribution voltages of 12-14 kv, currents of 100 to 400 amperes, and the associated charging and magnetizing currents cannot be switched without establishing persistent, spreading arcs.

Until recently, the only dependable solution to load switching needs has been the load interrupter, whose cost can only be justified at substations, subtransmission sectionalizing points, and at key sectionalizing points. Now with this new disconnect you can have universal load switching—economically—using Loadbuster.

### Portability the Key

The key to the Loadbuster system of load switching lies in portability —bringing the interrupting device to a matched disconnect or cutout only when load switching is desired. The cost of Loadbusters is spread over all the disconnects and cutouts in a distribution system.

Today you can solve the disconnect problem for your system with S&C's Tool Operated Disconnect . . . a distribution device that doubles for station-type equipment. And since this Tool Operated Disconnect is matched to Loadbuster, load switching comes free!

Write for full information.

*Specialists in High-Voltage Circuit Interruption Since 1910*

**S&C ELECTRIC COMPANY**

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

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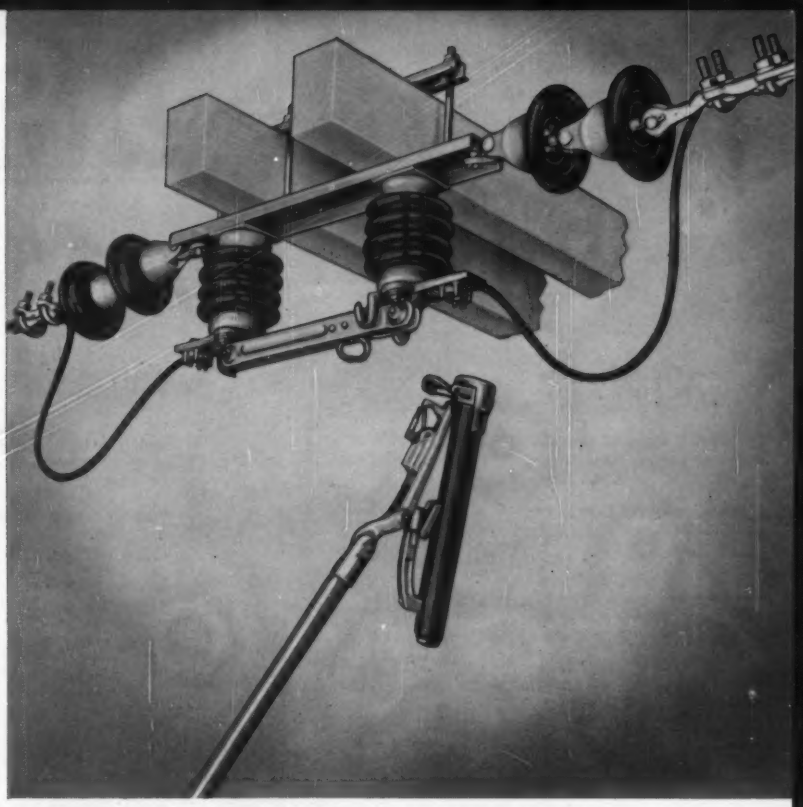
In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

# entire

# across

# Disconnect



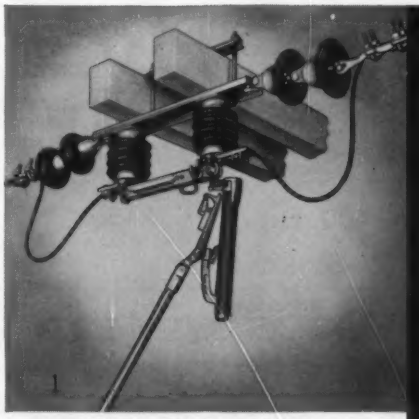
Loadbuster shown on universal pole, about to be hooked to S&C Tool Operated Disconnect

### How Loadbuster® Works

Attached to a universal pole, Loadbuster is simply hung on the attachment hook of the Tool Operated Disconnect, and the pull ring hook inserted in the pull ring. As the pole is pulled downward, the disconnect is opened, but a current path is retained through Loadbuster. As the movement continues downward, Loadbuster trips, breaking the circuit positively. It's that easy! There's no arc, no contact burning, and no danger to the lineman operator.

Designed to withstand usage over a long time without maintenance, Loadbuster is operable at any distribution system voltage through 14,400 volts, and can break all load currents through 400 amperes, as well as associated magnetizing and line charging currents; it can also switch all pole top capacitor banks.

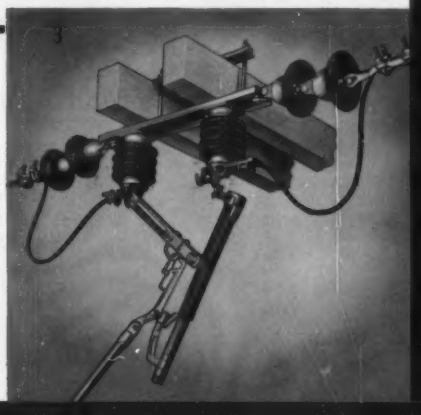
**S&C's XS Cutout with Loadbuster®**
This Cutout has been, until now, the only device designed to operate with Loadbuster



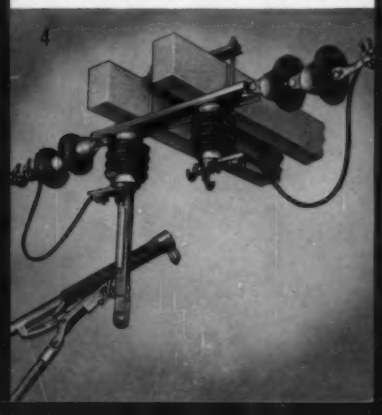

Loadbuster is hooked to attachment hook of disconnect

Loadbuster is pulled downward, opening disconnect blade

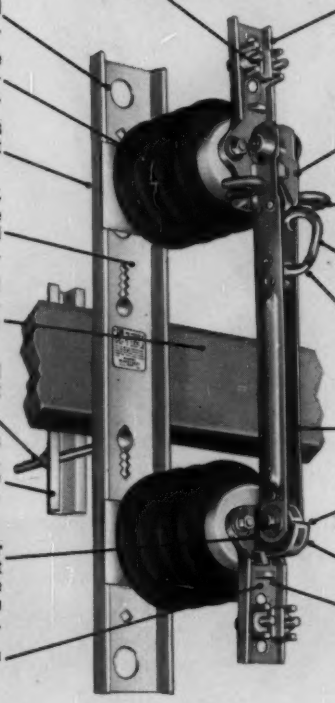
Loadbuster interrupts circuit and latches open




Loadbuster freed from attachment hook; to be twisted from pull ring



# *the new* S&C Tool Operated Disconnect



**Connector Bolts** can be inserted in one direction only so electrical clearance cannot be shortened.

**Dead-Ending Provision** base has holes in each end for dead-ending conductors.

**Post Insulators** provide large leakage distance between live parts and base.

**Husky Channel Base** gives flat bearing surface against crossarm.

**Versatile Mounting Provisions** for single and double crossarm, also structure; all needed hardware included.

**10½" Metal-to-Metal Open Gap Distance** is unusually long for distribution disconnects.

**Mounting Bolts** extend away from blade, protect clearances to live parts.

**Rigid Back-Up Members** permit secure draw-up. Bolts insertable only in one direction as shown to maintain electrical clearance.

**Double-Stud Insulator Mount** insures against shifting or turning of live parts, particularly when closing blade from the side.

**Current Path** virtually a straight line.

**Dual-Purpose Connectors** tinned to take aluminum or copper. Large area, reversible clamp accommodates wide range of conductors—up to 450 Mcm copper and 336 Mcm ACSR.

**Silver-to-Silver Contacts** backed up by stainless steel contact pressure springs.

**Attachment Hook for Use with Loadbuster** also serves as blade guide.

**Positive Latch and Pry-out** operates freely from all angles of approach.

**Pull Ring Position** gives compact construction—with minimum clearance requirements for open blade.

**Heavy, Embossed Blades** insure positive alignment when closing in.

**Machined Contact Surfaces** for best possible contact.

**Positive 90° Blade Stop**

**Cable Stop** prevents cable end from interfering with disconnect blade action.

**15 kv—400 amp**

**Only Distribution Disconnect with Published Performance Data**

The performance built into this disconnect (see below) is unmatched in the field of distribution disconnects . . . and the S&C Tool Operated Disconnect costs no more. Plus cost-free load switching! Designed for use with Loadbuster®, this disconnect is, when required, a load interrupter for currents up to 400 amperes.

That this disconnect will give years of maintenance-free, urban or rural service is clear from the construction details shown at the left.

The new disconnect comes complete with all necessary hardware for both single or double crossarm mounting (vertical or inverted), for use with both aluminum and copper conductors. There is nothing extra to buy or to specify.

| Style | Rating | | | | | | Insulator Characteristics | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Kv | | | Amperes | | | Inches | | Withstand Test Voltage kv (Min), 60-cycle | |
| | Nominal | Max Design | Impulse Withstand (BIL) | Continuous | Short Time Momentary | Short Time 4 sec | Leakage Distance | Dry Arcing Distance | Dry, 1 min | Wet, 10 sec |
| Branch Feeder | 15 | 15 | 95 | 400 | 20000 | 12500 | 13-3/4 | 6 | 50 | 42 |
| Main Feeder | 15 | 15.5 | 110 | 400 | 20000 | 12500 | 17 | 7-1/4 | 50 | 45 |
| Station Pin Insulator | 15 | 15.5 | 110 | 400 | 20000 | 12500 | 12 | 7-1/4 | 50 | 45 |
| Station Post Insulator | 15 | 15.5 | 110 | 400 | 20000 | 12500 | 15-1/2 | 7-1/4 | 50 | 45 |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# EDITORIALS

## What Is Your Popularity Quotient?

With the coming of fall, the time has arrived to plan ahead; to weigh what has been achieved and what remains to be done.

High on the list of matters that need attention by the industry as a whole is the matter of public attitude.

Let's face it! Electric utilities stand today high on the list of the most misunderstood industries in America. Our motives are maligned, our achievements belittled, and our interests ignored by political practitioners, freely and with hardly a hand raised in protest.

Yet this condition persists at a time when electric living is at the height of its acceptance and popularity. As an industry we stand at the pinnacle of our technical achievements, tongue-tied, and speechless—lacking the words, the will, or way to make ourselves as popular as our product.

But why? What are the reasons?

Do we appear too self-righteous in our public service role?

Do we seem strict, "rule-bound," and impersonal in our daily dealings with people?

Are our routine letters and other communications abrupt and stuffy? Have we tried to personalize our service bills?

Are we explaining our business to people in the community so they can understand and appreciate our role?

Does the management do all the public speaking? Or do employees have a chance to show their pride in electric service?

Are our customers encouraged to ask for advice on electrical matters not directly related to electric service?

Are company people good mixers or are they clanish and detached? How many are Scout Masters?

When we hold open house, is it always for employes and their families?

Has the high school science class visited the meter laboratory, seen the new substation, or visited the plant?

Does the company sponsor scholarships for promising students interested in science? Are company engineers doing guidance counseling in the schools and colleges?

How many high school students worked for the company this summer? Whose idea was it? Theirs . . . or ours?

These are only some of the questions we can ask ourselves. But in their answer lie clues to our standing with the people we serve, our popularity—our public personality.

No service lies closer to the needs and interests of people than ours. And in few businesses is favorable public attitude more important than in ours. Our product is popular. We can be too.

## Foresight Pays in Right-of-Way Acquisition

In the present period of rapidly expanding transmission systems, the early acquisition of right-of-way and substation sites appears to offer obvious economic advantages in a rising real estate market.

It is an unfortunate fact, however, that most utilities today are acquiring line easements on very short notice and so paying a premium for them.

Evidence to this effect was provided by a recent spot survey conducted by Electrical World among right-of-way men. For the fourteen companies in the sample slightly less than two years was the average advance lead time that right-of-way is acquired. Only three are acquiring appreciable amounts of land for the future rights-of-way in fee simple.

One right-of-way official put it this way: "Our company . . . has a widely varying amount of money spent from year to year on rights-of-way, usually depending upon getting a right-of-way for a particular line a year or two in advance. . ."

If there is one common characteristic of real estate and particularly rights-of-way, it is that prices never fall. They always climb. Couple with this the fact that many routes that were available a few years ago are now over-run with homes and industrial buildings and the case for advance acquisition is complete.

# Summer Peak Loads Top 1956

## 14 Utilities Surpass Previous Winter's Peak

**Increase compares with last year's 9.2% jump over '55. Peaks were close to predictions; most came in June, July**

| Company | 1957 Summer Peak Load Kw | Increase Over 1956 Summer Peak Kw | % | % Over Predicted Summer Peak | % Over 1956–7 Winter Peak |
|---|---|---|---|---|---|
| American Gas & Electric System | 3,791,000 | 297,000 | + 8.5 | −0.7 | + 1.2 |
| Atlantic City Electric Co | 268,000 | 3,600 | + 1.4 | ..... | +12.0 |
| Arizona Public Service Co | 489,000 | 50,200 | +11.9 | ..... | +11.3 |
| Baltimore Gas & Electric Co | 895,000 | 90,000 | +11.2 | +2.6 | + 9.0 |
| Boston Edison Co | 741,800 | 65,600 | + 9.7 | −2.7 | − 9.9 |
| Brockton Edison Co | 59,360 | 2,760 | + 4.9 | −5.9 | −21.7 |
| California Electric Power Co | 244,300 | 38,800 | +18.9 | −9.2 | +27.5 |
| Carolina Power & Light Co | 939,000 | 59,000 | + 6.7 | −2.1 | + 2.1 |
| Central Maine Power Co | 347,800 | 16,600 | + 5.0 | −1.7 | + 0.1 |
| Central Vermont Public Service Corp. | 73,100 | −2,200 | − 2.9 | −7.6 | −12.0 |
| Cleveland Electric Illuminating Co | 1,269,000 | 93,000 | + 7.9 | +2.8 | + 0.7 |
| Commonwealth Edison Co | 3,832,000 | 277,000 | + 7.8 | +1.1 | + 2.6 |
| Connecticut Light & Power Co | 598,175 | 35,399 | + 6.3 | −3.9 | −12.0 |
| Consolidated Edison Co | 3,460,000 | 257,000 | + 8.0 | +0.3 | + 5.4 |
| Consumers Power Co | 1,539,780 | 157,150 | +11.4 | −1.9 | − 2.0 |
| Dallas Power & Light Co | 685,400 | 75,800 | +12.4 | −0.7 | +101.3 |
| Delaware Power & Light Co | 328,300 | 36,100 | +12.4 | −0.7 | + 9.8 |
| Detroit Edison Co | 2,423,000 | 267,000 | +12.4 | +3.1 | − 2.1 |
| Duke Power Co | 2,177,360 | 136,725 | + 6.7 | −2.7 | + 5.3 |
| Duquesne Light Co | 1,064,000 | 12,000 | + 1.1 | +0.9 | − 4.9 |
| EEInc & OVEC | 3,294,000 | −27,000 | − 0.8 | −1.3 | − 2.9 |
| Florida Power Corp* | 400,000 | −48,400 | −10.8 | −8.5 | −30.9 |
| Florida Power & Light Co | 904,000 | 141,000 | +18.5 | −0.7 | − 3.2 |
| General Public Utilities | 1,680,100 | 137,000 | + 8.9 | +0.4 | − 2.3 |
| Hartford Elec Light-Conn Power Co | 285,300 | 20,200 | + 7.6 | −0.4 | −11.4 |
| Kansas City Power & Light Co | 713,000 | 103,000 | +16.9 | +3.3 | +38.8 |
| Kansas Gas & Electric Co | 437,800 | 36,100 | + 9.0 | −2.7 | +34.7 |
| Long Island Lighting Co | 659,200 | 69,700 | +11.8 | −2.3 | −14.4 |
| Los Angeles Dept Water & Power | 1,144,000 | 100,000 | + 9.6 | +0.4 | −10.6 |
| Louisiana Power & Light Co | 409,700 | 34,700 | + 9.3 | −4.7 | +28.5 |
| New England Electric System | 1,087,000 | 27,000 | + 2.5 | ..... | ..... |
| New Orleans Public Service Inc | 343,000 | 30,000 | + 9.6 | +1.5 | +48.5 |
| New York State Elec & Gas Corp | 642,000 | 74,638 | +13.1 | −0.5 | −10.7 |
| Niagara Mohawk Power Corp | 2,438,800 | 57,800 | + 2.4 | −5.3 | −11.2 |
| Northern States Power Co | 1,126,840 | 147,070 | +15.0 | +5.8 | − 3.8 |
| Ohio Edison System | 1,341,200 | 78,500 | + 6.2 | −4.7 | − 6.1 |
| Pacific Gas & Electric Co | 4,080,000 | 54,700 | + 1.4 | −2.9 | +10.3 |
| Pennsylvania Power & Light Co | 1,205,000 | 37,000 | + 3.2 | −2.2 | + 0.1 |
| Philadelphia Electric Co | 2,317,000 | 250,000 | +12.1 | +6.8 | + 6.9 |
| Portland General Electric Co | 587,000 | 28,000 | + 5.0 | −7.3 | −33.0 |
| Potomac Electric Power Co | 965,000 | 102,000 | +11.8 | +4.9 | +35.1 |
| Public Service Co of N.H. | 247,300 | 10,600 | + 4.5 | −7.4 | − 3.5 |
| Public Service Electric & Gas | 2,273,000 | 318,000 | +16.3 | +5.7 | +10.3 |
| Rochester Gas & Electric Corp | 302,800 | 28,000 | +10.6 | +2.6 | − 5.6 |
| Salt River Power District | 254,100 | 26,400 | +11.6 | −1.4 | +63.6 |
| Seattle City Light Dept | 543,000 | 13,000 | + 2.5 | −5.9 | −28.5 |
| South Carolina Electric & Gas Co | 452,000 | 41,000 | +10.0 | −1.5 | +15.0 |
| Southern California Edison Co | 2,558,200 | 231,600 | +10.0 | +0.7 | + 2.2 |
| Southwestern Gas & Electric Co | 428,200 | 27,500 | + 6.9 | −1.9 | +43.7 |
| Southwestern Public Service Co | 598,000 | 36,300 | + 6.4 | −1.9 | +38.8 |
| Tacoma City Light Dept | 299,000 | −10,000 | − 3.2 | −13.1 | −19.8 |
| Tennessee Valley Authority | 8,030,000 | 418,000 | + 5.5 | −2.1 | −13.1 |
| Union Electric Co | 1,520,000 | 113,000 | + 8.0 | +1.3 | +24.1 |
| United Illuminating Co | 306,300 | 8,800 | + 3.0 | −2.1 | − 5.6 |
| Utah Power & Light Co | 483,000 | 13,000 | + 2.8 | −5.5 | − 8.2 |
| Virginia Electric & Power Co | 1,333,000 | 161,000 | +13.7 | +2.0 | + 8.6 |
| Washington Water Power Co | 467,000 | 28,000 | + 6.4 | −1.1 | −27.4 |
| West Penn Electric System | 1,451,000 | 68,000 | + 4.9 | −3.3 | − 4.5 |
| Western Mass Electric Co | 231,700 | 11,500 | + 5.2 | +3.2 | − 4.5 |
| | 73,062,915 | 4,965,242 | + 7.3 | −0.7 | ..... |

*Georgia Power & Light Co, former FP subsidiary, load included in 1956 figures but excluded in 1957

Peak loads this summer were about 7% greater than they were last summer. This continued growth in summer peak was accomplished despite the lack of major sustained hot weather in most regions.

An informal survey by Electrical World shows that 85 Class I utilities reported peaks aggregating 73,062,915 kw. This represents an increase of 4,965,242 kw, or 7.3%, over their 1956 total non-coincident summer peak. These companies operate about 65% of the installed capacity in this country.

The increase, although about as predicted by the reporting companies, was not as much as that registered in the summer of 1956. A similar survey last year (EW, Sept. 17, 1956 p 124), revealed a 9.2% increase over the previous year's summer peak for essentially the same utilities.

### Most Peaks Came Early

Over half of the utilities reported that their peaks occurred in the early part of the summer—either June or July. In fact one third of them, principally in the Eastern section of the country, had peaks in June.

Niagara Mohawk Power Corp, Philadelphia Electric Co, and Public Service Electric & Gas Co all experienced their peaks on June 18. Consolidated Edison Co of New York, Inc, had its peak about a week later.

### Predictions Were Close

The majority of companies had peaks pretty close to what they had predicted. Those who were considerably below their predictions cited relatively mild weather as the controlling factor. "Hot weather came earlier" and "August temperatures were lower than expected" were some typical comments by utilities with minus signs in this column. Those who appreciably exceeded estimates attributed the in-

# Total By 7%

crease to the impact of air conditioning on their systems.

Some of the companies having June peaks felt that the magnitude would have been higher if the peaks had occurred later in the summer. Fourteen companies whose system peaks normally occur in winter had summer peaks exceeding the previous winter peak.

**New Summer Peak Utilities**

Consolidated Edison Co now expects the 1957 summer peak to be its yearly peak unless abnormally low temperatures occur during the forthcoming pre-Christmas season. Public Service Electric & Gas Co expects its annual peak to occur in summer starting in 1958. And several other companies made similar comments.

Industrial activity apparently was substantially normal. Very few companies made any reference to it. A few had adverse comments but they were so few that they fail to give any indication of declining activity.

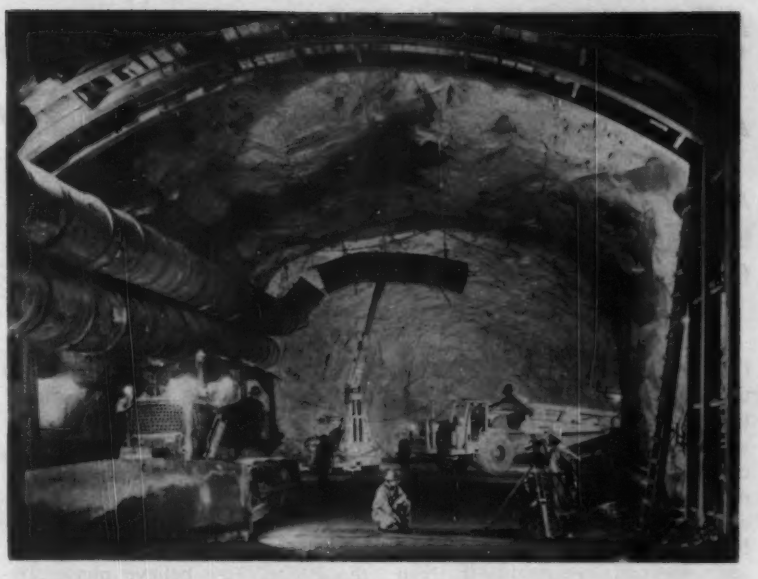
The Tennessee Valley Authority reported their load would have been higher but for about a 500-Mw reduction in Atomic Energy Commission requirements (EW, Aug. 12, p 73). And Duke Power Co reported a decline in the textile industry activity in their operating area.

## Electric Utility Plants Use 12% More Coal in '56

Electric utility plant consumption of coal rose more than 12% in 1956, the National Coal Association has reported. A new high of 153.5-million tons was burned last year in steam plants compared with 136.6 million in 1955.

The NCA study covers 765 plants operated by 313 companies in 46 states and the District of Columbia. These plants account for 97% of total U. S. electric steam plant coal consumption.

In 1956 use of oil by electric utilities declined 1.2% and natural gas usage gained 5.8%, the coal group noted.



## Mountain Gets Built-in Powerhouse

Inside a mountain in northern Canada, workmen are busy excavating a cavern to make room for a huge underground powerhouse whose five generators will produce one-million hp of electricity.

The $125-million project, located at Chutes-des-Passes on the Peribonka River more than 300 miles north of Quebec City, is being built by Aluminium Limited to supply additional power to its aluminum smelters to the south.

An outstanding feature of the subterranean project is the six-mile tunnel, a portion of which is shown above. This main tunnel, with its three access tunnels, will descend from a storage lake, carrying water at 18,000 cfs. At the tunnel's end, the water will drop almost 636 feet down to the powerhouse.

The tunnel burrows nearly 400 feet underground and has been equipped with its own "air conditioning system" (pipes on left) which provides for a continuous circulation of air.

In conjunction with the hydro project, the aluminum firm will also build a community nearby, with all facilities—houses, stores, schools, etc—serviced entirely by electricity.

Chutes-des-Passes, Aluminium Limited's sixth hydroelectric project in the Saguenay-Peribonka River area, will give the company a total of 4,780,000 hp in Canada when the powerhouse and tunnel are completed in August, 1959.

## Vepco Unit Burns Refinery Gas, Coke

Dedication of Virginia Electric & Power Co's first Yorktown Power Station unit took place September 10. The 150-Mw unit makes use of refinery gas and delayed coke from a nearby refinery as fuel.

About 1,200 tons of coal and coke is used at full daily operation producing up to 1.2-million lb of steam per hour at 1,900 psi and 1,000F. Feedwater temperature is about 476F at 2,000 psi. At 5 lb overpressure, feedwater hits 1,000F.

The steam generator has two water-cooled furnaces separated by a common water-cooled wall. Furnaces are arranged for firing pulverized coal and coke, refinery gas, and light oil. The gas burners are set to carry 50% of boiler load on gas and can be increased if this fuel becomes available. Oil is used for firing up and for emergencies only.

General Electric Co supplied the hydrogen and liquid-cooled generator, the third of its kind.

# AEC's Regulatory Role Evolves

**Atom has shifted into public domain as a commodity that can be regulated. Question facing AEC is when it should expand fulltime staff for future public hearings**

Next month the Atomic Energy Commission holds the second and third public hearings on construction permits for nuclear reactors. A year ago this probing into the security sensitive atom was unheard of. But since then the atom has evolved from a classified domain born of wartime to a largely public, understandable commodity that can be regulated.

AEC's trail blazer was the 1956 public hearing on licensing Power Reactor Development Co's Monroe, Mich., project. The hearing, on which a decision is now pending, did more than mark the baptismal fire of AEC as a regulatory agency. It put the atom in the open where it could be dealt with under the Administrative Procedures Act by men who weren't necessarily technical experts.

This doesn't imply that the expert is being pushed aside. Those close to the PRDC case believe phases of licensing may have to be handled by experts. Some safety questions may have to be settled by tests, for example. In other instances, phases of hearings may be held before a group such as the Advisory Committee on Reactor Safeguards.

It is too early to speculate on long-term implications of the PRDC hearing. Much depends on the AEC decision and on what interpretation is placed on AEC regulations in the future. It will take a number of hearings, for instance, to establish the nature of proof required by AEC in the issuance of a construction permit. More important, perhaps, will be the relationship of construction permits to operator licenses.

### Cart-Before-the-Horse View

During the PRDC case this relationship was in the forefront. Some contended the safety hearing was pointless because issuance of a construction go-ahead did not imply that an operator's license would be granted and that there was no danger as long as the project wasn't operating with nuclear fuel.

To this the intervening labor unions replied that the hearing had to be held at this stage since the burden of safety proof now is on the builder. Later, they argued, the burden would be on the intervenors.

### Construction Permit Is Main Step

Another argument raised by the unions was that pressure would be strong on AEC to grant an operator's license for a project after the builder had spent millions to construct it. This question is still unresolved. The tendency, unofficially, seems to be to regard the construction permit hearing as substantially the major part of procedure toward eventual issuance of an operator's license.

Obviously this phase of AEC's regulatory process is going to be closely watched. No potential builder will be inclined to construct an atom plant on the basis of a construction permit if he knows this adds nothing to his chances later of obtaining a license.

When AEC scheduled the PRDC hearing there was some concern about the commission's lack of a trained examiner. AEC borrowed Jay A. Kyle, the Federal Communi-

## Regulatory Status of Power Reactors*

| Project | Where It Stands | Next Step |
|---|---|---|
| General Electric-Pacific G&E | Operator's license issued clearing project | |
| Duquesne Light | Near completion | No licenses needed; AEC to operate |
| Commonwealth Edison | Building; construction permit issued | Operator's license |
| Consolidated Edison | Same as above | Operator's license |
| Power Reactor Development | Building; conditional construction permit issued | AEC hearing findings on safety; eventually an operator's license, if project is cleared |
| Yankee Atomic Electric | AEC contract signed | Construction permit, subject to public hearing |
| Florida Nuclear Power Group | Negotiating AEC contract | Contract signing; construction permit subject to public hearing |
| Northern States Power | Negotiating AEC contract | Same as above |
| Carolinas Virginia Nuclear Group | Negotiating AEC contract | Same as above |
| Wolverine Co-op | Negotiating AEC contract | No licenses needed; AEC will own, operate reactor |
| Elk River Co-op | Negotiating AEC contract | Same as above |
| Piqua, Ohio | Negotiating AEC contract | Same as above |
| Chugach, Alaska, Co-op | Negotiating AEC contract | Same as above |
| Consumers Public Power District | Negotiating AEC contract | Same as above |

* Includes projects past or at AEC negotiating stage only.

cation Commission's assistant chief counsel. He has shown that a good hearing examiner can cope with the atom even though he has not had personal backgrounding in the subject.

Kyle's role was to certify the record. In other Washington regulatory agencies, the hearing examiner issues a decision before passing the case on to the full commission or board for final action.

In time AEC must adopt this procedure, observers believe. Officials cite two reasons, though, on why the change isn't needed now:

- While legislation makes it mandatory for AEC to hold hearings on construction permit applications, these probably won't amount to more than a handful each year for the next few years.
- It isn't likely that every construction permit is going to be contested. When they are not, public hearings will be routine and brief.

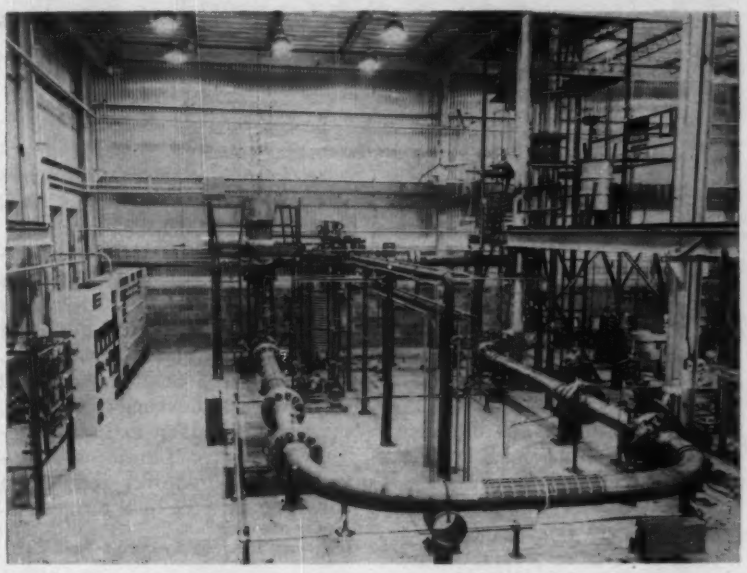
AEC's problem, therefore, is whether it should have a fulltime examiner and staff to cope with what could be no more than a few days work a year. Eventually, of course, application volume will justify it.

## ECAP'S Next Atom Ad to Highlight Progress

The Electric Companies Advertising Program will run two-page advertisements during late October into December as part of the series to report progress by electric companies in the development of atomic power. Purpose of the forthcoming ads is to better identify the companies and the part they are playing, an ECAP spokesman said.

The ads will depict progress at the Dresden Plant near Chicago, the experimental unit at Pleasanton, Calif., and research and planning developments for the plant near Rowe, Mass.

The report will appear in magazines such as Saturday Evening Post, Life, Look, Readers Digest, Coronet, Time, Newsweek, and Redbook. It is the second two-page ad in the 16-year history of ECAP.



## Loop Will Test Slurry Flow in Reactor

A test loop which will simulate various flow conditions of slurry in an experimental reactor project is now being constructed in Westinghouse Electric Corp's atomic power department.

Designed for the proposed Pennsylvania Advanced Reactor, the loop will test the interaction of high and low pressure systems, methods for concentration control, and methods for complete filling and draining of the plant. Slurry will be circulated at PAR reactor pressures, temperatures, and concentrations.

PAR is sponsored jointly by Pennsylvania Power & Light Co and Westinghouse. Results of the PAR experiments will be incorporated in a 150,000-kw aqueous homogeneous reactor which will operate on PP&L's system.

## NUCLEAR NOTES

**Permissible levels of radiation** exposure are expected to be reduced by one third this fall. The proposed AEC change would permit not more than 15 Rems (Roentgen Equivalent Man) in any one year per worker and not more than an average of five Rems a year. General public limit will be an average of one-half Rem per year. If adopted, the standards could up construction costs at plants requiring added safeguards.

**Britain's 500-Mw** atomic power station at Hinkley Point, Somerset, nears construction stage as contract is let to a group comprising English Electric, Babcock & Wilcox, and Taylor Woodrow. It will have two gas-cooled, graphite-moderated reactors, each enclosed in a 67 ft diam spherical pressure vessel. The $168-million station will be completed in 1962.

**Russia's heavy water** production is up to about 100 tons per year according to "Chemische Industrie," a German magazine. Two big plants account for the output; one using the hydrogen-sulfide exchange procedure in which water is enriched to 5%, the other an ammonia-hydrogen exchange.

# How Engineers View Their Lot

**Challenging work, advancement, and salary rank high as ideal job factors in new survey; working quarters and clerical assistance are on minus side**

As interviewers sounded out engineers on career satisfactions recently, one facet of the engineers' viewpoint came out at several points in the survey. "There are two separate worlds—engineering and non-engineering—and they (the engineers) are somewhat ill at ease in the latter."

This is a sidelight of a new survey report, "Career Satisfactions of Professional Engineers in Industry," sponsored by Professional Engineers Conference Board for Industry in cooperation with National Society of Professional Engineers.

Compiled from several hundred depth interviews by Opinion Research Corp, the study was designed to bring out non-salary satisfactions of engineers at three stages of professional experience—3 to 6 years, 10-15 years, and 20-25 years.

The "two separate worlds" viewpoint came in response to this question: "Some people say that engineers have to change their way of doing things if they want to be successful managers. Do you think there is a lot of truth in this, or is it greatly exaggerated?"

This need for change is true said 35% of those in the 3-6 year group; 45% with 10-15 years; and 47% in the 20-25-year group. The report notes that, "Here the engineers play back the stereotypes that are often associated with their group." These include getting along with people, working as a team, acquiring a broader perspective, and learning to compromise.

### Experience Shapes Values

When asked to rate 15 different elements in terms of their importance to the ideal job, all three groups agreed that challenging work, advancement opportunity and good salary were top items. Beyond these basics, the report observes, "the engineer's job values are very importantly shaped by experience in the job he has."

Ranking for job shortcomings are about the same for the three groups. Working quarters, clerical assistance, and the definition of authority and responsibility are things most lacking in the engineers' own job.

Asked what are the most satisfying factors in their present jobs, the engineers replied that high caliber of their colleagues, opportunity for training and advancement were best.

As for things management could do to foster professional recognition, the engineers asked to be kept informed, sought out for ideas, identified with their work, and shown how it fits into the total picture.

### Training Desires Are Non-Technical

The survey found the engineer "feels deficient in the non-technical skills, and welcomes company training that will extend his competence beyond the purely technical." He would gain most from courses on organization and planning, how to supervise, and how to handle people, according to the interviews.

Most engineers play a relatively small role in representing the companies in community affairs. But for those companies that ask engineers to serve as spokesman, there is a 71% vote of approval. "Possibly, if companies made more overtures in this direction, engineers would be encouraged to assume responsibilities of this kind," the report notes.

In looking back, 67% of the younger engineers said there were things lacking in college training they received. And about 76% of those with more experience shared this view. The educational shortcomings most frequently mentioned were economics of industry, written and oral self expression, human relations, and liberal arts.

### Management Post Is Goal

The idea that going into management is the route to success "is very prominent in the engineer's thinking," the report states. Both the financial and nonfinancial rewards of management are the basis for the attraction. "Success in the purely technical world offers no comparable marks of recognition or status."

Eleven major companies were included in the survey. These firms are among the 200 largest U. S. corporations in aircraft, automobile, chemical, electronics, electrical machinery, heavy equipment, petroleum refining, and rubber industries.

# Connecticut Merger Slated

Two Connecticut utility companies with a long record of cooperative interconnections will merge in the next few months if consolidation plans of directors are approved.

The boards' actions were announced last week by Hartford Electric Light Co and Connecticut Power Co. Stockholders of both companies will vote on the plan October 14. Approval of two-thirds of the outstanding preferred and common stock is required for the deal.

The sanction of Connecticut Public Utilities Commission and Federal Power Commission is also needed.

The merger calls for exchange of three-quarters of a share of Hartford common for each share of Connecticut outstanding. Preferred and bonds would be treated substantially on a share-for-share basis. Hartford owns about 8% of Connecticut common.

The two utilities serve some 212,000 customers. Combined utility plant investments total more than $175 million. The new firm would be called Hartford Electric Light Co.

Practically all of Connecticut Power's firm requirements have been purchased in past years from its neighbor. A pooling agreement in 1954 found CPC paying about 28% of joint transmission and generation expenses.

## Rule Changes . . .

### on liberalized depreciation are debated at FPC hearing

Proposed accounting rule changes on liberalized depreciation would conflict with Securities & Exchange Commission regulations for electric utility holding companies, Donald Cook, former SEC chairman and executive vice president of American Gas & Electric Co, told FPC.

Cook appeared with other electric and gas company representatives to present views on proposed rule changes to the uniform system of accounts. The changes would provide deferred tax accounting for federal income tax accruals resulting from accelerated amortization and liberalized depreciation.

Cook also said the proposed amendments will conflict with various state commission requirements. He suggested that since a number of accounting methods are acceptable in various states, this is a case where uniformity of accounting, as implied in FPC amendments, cannot be achieved.

The one-day hearing found gas transmission companies generally favoring the FPC amendments and the electric companies opposing them.

#### EEI's Priest Prefers Status Quo

A. J. G. Priest of Washington, representing Edison Electric Institute, asked FPC not to impose these new accounting concepts. The situation is being met adequately by commissions, he said.

Vintage-year accounting, as proposed in one amendment, is neither necessary nor proper, Priest said. It would involve companies in additional costs he added.

F. M. Beatty, partner of Arthur Anderson & Co, favored the proposals with minor changes. Deferred tax accounting is the proper method, he said, and he did not see any need for optional treatment.

William E. Torgelson, Wisconsin Public Service Commission, opposed the changes on grounds that deferred tax accounting would set up big reserves of interest-free credit. These, in effect, would be involuntary contributions from rate payers to companies, he argued.

**PRIESTS RAPIDS RELIC is examined by Owen A. Hurd, meeting chairman; Walter J. Barrett, AIEE president; M. M. Ewell, AIEE vice president, at Pasco meeting**

# AEC Retains Policy

### Northwest AIEE assured by Commission official at Pasco; McCune cites benefits of industry nuclear development

No shift in Atomic Energy Commission policy is in prospect, the American Institute of Electrical Engineers was assured at its recent meeting at Pasco, Wash.

AEC will continue to request direct federal construction funds for large-scale prototype reactors when "technically ready and feasible" projects are not pursued by civilian industry under AEC invitation programs, said Dr. Glen Wensch, AEC Civilian Reactors Branch. His review, following Congressional passage of a bill providing direct federal development of several power reactors, was watched closely for a shift from previous AEC policy.

#### Cites True Yardstick

Nuclear power generating capacity projections in various countries, Wensch continued, are not valid yardsticks of world leadership. Factors in a realistic appraisal, he said, would include technology diversification, scope of power and industrial usage development, fuel and material supply development, and insurance, inspection, and population protection handling.

F. K. McCune, General Electric Co, said that the rapid industrial progress in peacetime atomic energy should convince the public and legislators of the greater benefit of private development. He stressed the "amazing progress" in uranium recovery and special materials production.

Start-up time of pressurized-water reactors only slightly exceeds that of conventional plants, said A. R. Jones and R. L. Witzke, Westinghouse Electric Corp. Rapid power swings might be restricted by xenon equilibrium changes near refueling time, but such restriction is not very important to utility plants. Nuclear differs from conventional plant shutdown mainly in the necessary removal of fission-product heat.

A boiling-water reactor's start-up time and load-pickup rate about equal those of a conventional plant, said A. F. Ariey, Pacific G & E Co, and GE's E. P. Peabody. This type plant is distinguished from the conventional plant, they said, by its greater need for protective devices.

#### Gives Hanford Experience

Outlining experience with control power supply for Hanford production reactors, L. P. Reinig, GE, said that originally the battery bus fed a low-inertia motor-alternator supplying instrumentation. But sudden load changes brought sharp frequency and voltage dips with consequent scrams. The small aggregate

of sensitive devices, which could not tolerate dead time or sharp swings, was moved to a reliable dynamotor. Other instruments were allocated to high- and medium-speed throwover buses where they could take advantage of steam-turbine "house" generators operating in parallel with the normal BPA power supply.

### Gas Turbines Increase

Seven 30-Mw gas turbines are being built for Canada, according to Z. S. Stys, Brown Boveri Corp. V. P. Purcell, GE, reported that the first U.S.-built gas turbines greater than 20 Mw are under construction for Latin America. The Western Hemisphere will get 444 Mw of these prime movers for central stations in 1957-58, almost twice the amount installed in. 1946-56.

Base loading of gas turbines is economical only when fuel costs are low, Harry Langstrom, Westinghouse, told the AIEE. He estimated total operating cost at just under 5½ mills per kwhr when natural gas costs 25¢ per million Btu. Stys, Purcell, and Langstrom stressed the attractiveness of integrating gas turbines into predominantly hydro systems for peaking service.

Describing gas turbine efficiency gains available for higher operating temperatures, Stys said his company generally holds inlet to 1,200F, limited by ability to cool austenitic steels. Thus operated, turbine life will be comparable to that of modern steam turbines. At 1,200F, firing Bunker C fuel is practicable, requiring only turbine washing at 300-to-400-hr intervals. Fuels need only be specified to have residual ash at least 50% water soluble, a condition easily met.

### Cites Excitation Tests

GE feels that recent metallurgical advances make inlet temperatures above 1,200F feasible, Purcell said. At such temperatures, Bunker C specifications must be rigid in limiting sodium and vanadium content. On-site oil treating, he said, is usually the answer.

R. L. Krahn, U.S. Corps of Engineers, said that field tests on excitation systems demonstrated disagreement between the response determined by the present definition of transient performance and that obtained when the action of continuously acting regulators was included. No great error was incurred, he said, by testing the regulator-exciter combination alone with the exciter open-circuited, although more exact determinations are possible by connecting the exciter to its fully-loaded synchronous generator. He concluded that field tests of regulator-exciter combinations should be the industry standard for establishing nominal exciter response values. He recommended that the standard test call for a 12% input voltage error into the regulator circuit, and that both buck and boost tests be made.

Most failures on vertical waterwheel generators occur when the unit is started after shutdown, said R. A. Baudry, Westinghouse, explaining that then thrust pad temperature and thermal distortion are maximum. He recommended low-speed coasting until pads are cooled when immediate restart of unit is expected.

### Armor Rod Standard

A 106-mile, 230-kv transmission line with wood-pole crossarms and crossbraces was described by Earl Baughn, Washington Water Power Co. Otherwise of conventional H-frame construction, structures support all-aluminum 1,272-MCM conductors. Vibration dampers won't be used except where experience requires. A few combination suspension clamp/armor rods are being tried; otherwise, standard armor rods are being installed.

### Derives Sag Calculations

F. J. Hubert, Los Angeles Department of Water & Power, derived a simplified method for sag calculations of conductors. The graphical method recognizes changes in unstretched cable length, temperature, loading, and modulus of elasticity.

C. F. Bannon and L. L. Gleason, Seattle City Lighting Department, analyzed plans for applying pole-mounted, 4-kv capacitors to Seattle's primary networks. Economics dictated holding substation buses at 1.0 pf. Studies showed that a 300-kvar fixed and a 450-kvar switched bank should be installed at midpoint of each of the 24 network tie feeders in each 72-Mva area. Bank neutrals are left ungrounded. Control of switched banks is by current relay in a distribution transformer secondary CT, obtaining sample representation of secondary load and attaining switching diversity.

A mobile test trailer with controls, oscillographs, and darkroom, is used in Southern California Edison Co's program for testing circuit breakers, fuses, and oil switches, according to E. E. Tugby. In the program, established in 1954, tests are made with manufacturers' cooperation, and results are released only by them. Primary objective of the program is to prove the full margin of capacity of equipment design, but tests have also indicated the maximum usable ratings of older equipment.

F. J. Maas, Bonneville Power Administration, presented the report of the AIEE Working Group on Fire Protection and Minimizing Fire Hazards in Substations. Surveying major U.S. and Canadian utilities, the group found better than 90% have some form of fire protection, with 40 to 150-psi fog water preferred. Dry chemical extinguishers are used by about half.

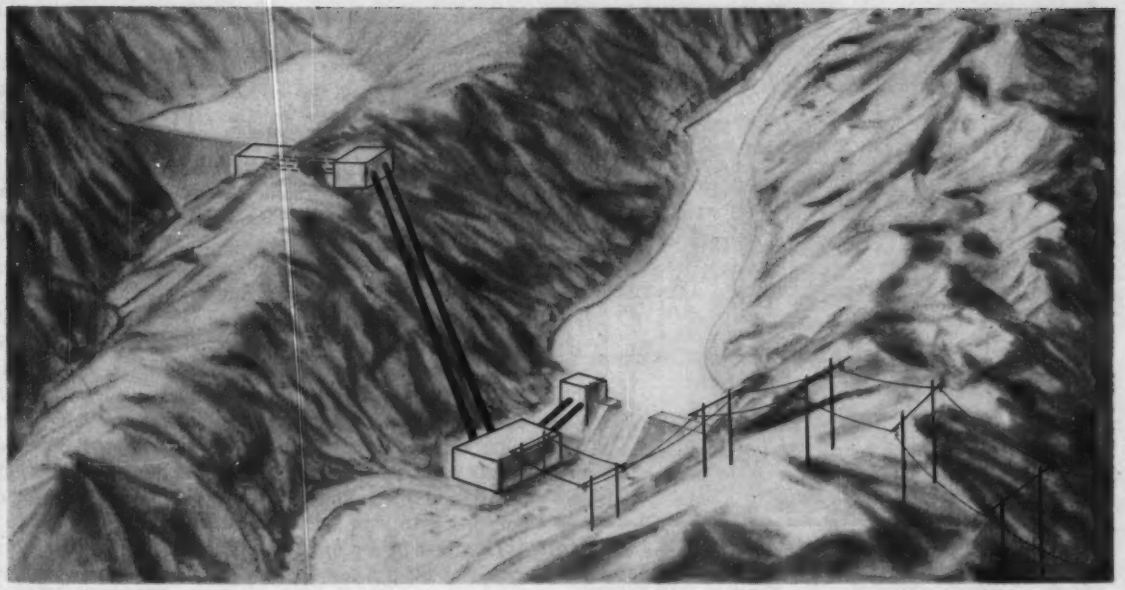
### Describes Relay Trouble

M. A. Bostwick, Portland General Electric Co, cited cases of improper relay characteristics and settings which caused unnecessary outages.

High-speed reclosing of industrial system breakers was recommended by S. R. Durand, Allis-Chalmers Mfg Co, as an aid to process continuity, but he cautioned that it shouldn't be applied without study of residual bus voltage decay. Large high-speed induction and synchronous motors can be damaged when reclosed too rapidly to an undecayed bus.

M. A. Lantz, BPA, explained programming of a digital computer for short-circuit calculations. Automatic computations are turned out on networks having 36 to 50 impedance elements, exclusive of but accounting for mutual impedances. Lantz described calculation of intermediate fault positions along a line.

He said 100 intermediate positions are checked in 1 to 2 min. Previously network analyzers took longer than an hour for 8 to 10 positions.



**SUITABLE PUMP STORAGE SITE** makes maximum use of natural advantages permitting low dams, small reservoirs, high heads and short penstocks. With plant downstream of lower dam deep submergence of pump units is possible

# Pumped-Storage Hydro Attractive

## Lower overall costs, along with flexibility, make it desirable as alternative to steam additions where suitable sites are available

**E. S. LOANE**, Assistant to the Vice President, General Public Utilities Corp, Reading, Pa.

Recent physical and economic developments suggest that pumped-storage hydro plants as an alternative to steam should be reevaluated as an important element in system planning. Where favorable sites are available, it may be feasible to develop pumped-storage plants in fairly large sizes and at costs comparable to equivalent new steam capacity. When these costs are coupled with lower overhead and operating costs inherent in hydro generation, pumped-storage projects may be proved out on an economic basis.

### Pump-Storage Costs About $140 per kw

Renewed interest in pumped-storage has been fostered by development of an efficient, reversible pump-turbine. Preliminary studies on a conservative basis were made for the General Public Utilities system where they showed that a considerable amount of pumped-storage hydro could be built for about $140 per kw. This figure is less than the "justified" cost and equal to or less than the cost of new steam capacity.

Covered in the studies were possible sites with heads ranging from 400 to greater than 1,000 ft. These are capable of development with plants having capabilities from 50 to several hundred Mw. Assuming that the sites are available and their development economical, the 3,000-Mw GPU system may be able to use up to 400 Mw of this hydro by 1965 when its peak load will be about 3,400 Mw. In general, a system without other hydro capacity might utilize pumped-storage to the extent of 10 to 15% of total system capacity.

### Simplest Form Considered in Studies

The studies for GPU involved pumped-storage in the simplest form—a pumping-generation system in which all or nearly all the water is recirculated between upper and lower reservoirs. Such pumped-storage has the greatest potential use by other utilities.

Justification of pumped-storage must be based primarily on comparative estimates of cost and value. Pumped-storage capacity, when planned for reasonable load-factor operation, supports an initial investment up to $25 per kw more than the average cost of steam capacity. This provides a substantial margin between cost and value which becomes even more encouraging when several unevaluated advantages are considered.

Proper evaluation of pumped-storage begins with a review of system load characteristics. On many electric systems, load characteristics are such that maintenance requirements may exceed the seasonal valley in the load curve. Capacity availability is then almost equally important every week of the year. For pumped-storage to be considered a satisfactory alternative to steam, it must have the same or better availability. Depending

Adapted from a paper presented at the Pennsylvania Electric Association System Planning Committee Meeting.

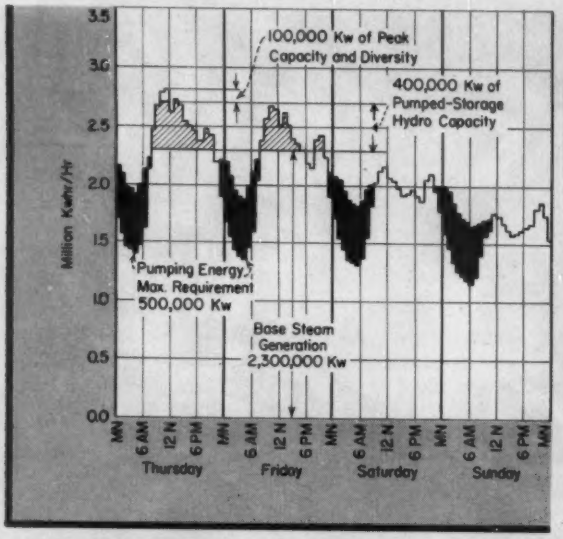



**FIG 1—SUMMER-WEEK LOAD CURVE is projected for GPU system for sometime before 1965. Below the 100,000 kw of purely peak load are requirements which might be carried by an assumed pumped-storage capacity of 400 Mw**

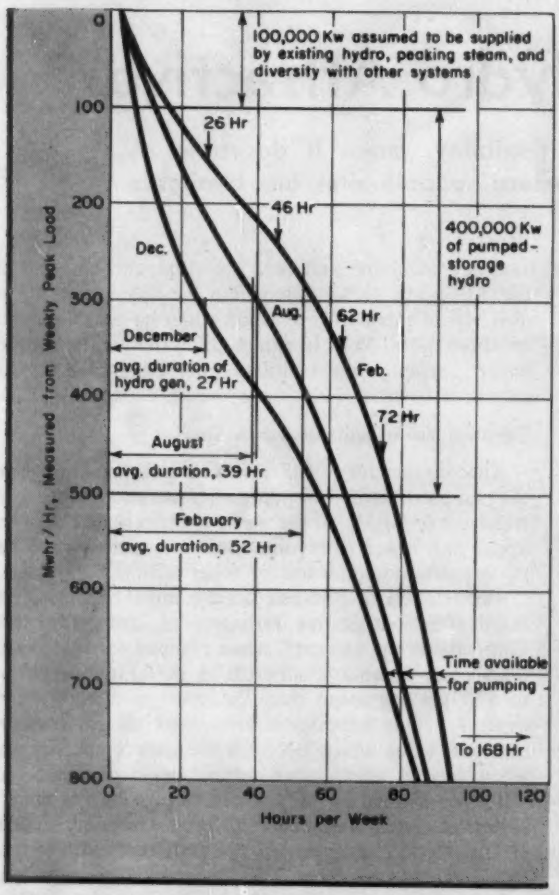



**FIG 2—LONGEST PEAK LOAD durations for pumped-storage capacity would occur from January to March, as indicated by the 52-hr average duration in February. Shortest load duration occurs at the time of the December peak**

upon the season, hydro operation may be required up to 15 hr per day.

A typical summer-week load shape, such as could be experienced on the GPU system sometime before 1965, is shown in Fig 1. The GPU system comprises Pennsylvania Electric Co, Metropolitan Edison Co, New Jersey Power & Light Co, and Jersey Central Power & Light Co. This integrated system is operated as part of the Pennsylvania-New Jersey-Maryland Interconnection. Only two weekdays plus a Saturday and Sunday are represented on the curve. Peak load in this week is 2,800 Mw, and the load factor about 72%.

In the peak of the load there is a band of capacity with extremely low load factor. This capacity can be carried by two hydro plants, by operating steam capacity at its peak rating and through diversity arrangements with interconnected companies. Total available from these sources is assumed to be 100 Mw. Below this purely peak capacity are load requirements which might be carried by pumped-storage. Use of 400 Mw of pumped hydro on this load is assumed.

Duration of the load to be carried by pumped hydro increases from a few to a maximum of 14 hr per day. Average duration for this typical summer week will be less than 8 hr per day. Average duration of 8 hr means that the pumped-hydro energy in the load curve is equivalent to 8-hr use of the full capacity. Energy required for pumping is shown as an addition to system loads during the night and week-end periods. This pumping energy is roughly 50% more than the energy obtained from pumped-hydro generation—3 kwhr must be produced off peak to deliver 2 kwhr on peak.

### Pumping Could be Done Each Night

Distribution of this pumping energy between night and week-end periods depends not only on the load shape, but also on pump-turbine characteristics. If generating load factor is low, or pump capacity large compared to turbine capacity, perhaps all pumping could be done in the 7 to 8 hr available each night. This is desirable because it reduces the useful reservoir storage capacity to that required for one day's operation. But in Fig 1 pumping is extended until Sunday noon, when the upper reservoir presumably is refilled.

Indicated areas of generation and pumping represent the output expected and input required if hydro is to replace steam as system capacity. Once built, a project need not be operated as indicated. Cost of hydro energy will vary principally with fuel cost and efficiency of the steam plants supplying the pumping energy, and to a lesser extent with the characteristics of the hydro unit and transmission system. Pumped-storage should be incrementally loaded as steam plants are, and should generate in any day only as much as can be justified by the then expected cost differentials.

Distinct seasonal characteristics are apparent in the peak portion of weekly load. Longest duration of pumped-hydro generation are in January, February, and March; shortest at the time of the December peak. This characteristic is illustrated in Fig 2. Again assuming pumped hydro of 400 Mw, the approximate average equivalent full-load generation per week is 52 hr in February; 39 hr in August, and only 27 hr in December. Duration of required generation for any increment of capacity also may be shown. Because the

## Table I—Composite Characteristic of a Pump-Turbine Unit

(Nominal 75-Mw unit, average static head 750 ft)

| | Unit operated at Design Head | | Head reduced |
|---|---|---|---|
| | Full load | 90% load | by 5% |
| Turbine Operation | | | |
| Net head, ft | 735 | 735 | 700 |
| Discharge, cfs | 1,400 | 1,260 | 1,350 |
| Efficiency | 88.5% | 88.5% | 86.5% |
| Turbine output, 1,000 hp | 103 | 93 | 93 |
| Generator output, Mw | 75 | 67.5 | 67.5 |
| Pump Operation | | | |
| Dynamic head, ft | 760 | ..... | 730 |
| Discharge, cfs | 1,150 | ..... | 1,250 |
| Efficiency | 89.5% | ..... | 89.5% |
| Shaft input, 1,000 hp | 111 | ..... | 116 |
| Motor input, Mw | 84.5 | ..... | 88.5 |
| Pump-Turbine-discharge Ratio | 82% | 91% | 93% |
| Motor-input-Gen.-output Ratio | 113% | 125% | 131% |
| Normal speed, rpm | 277 | 277 | 277 |
| Runaway speed, rpm approx | 400 | 400 | 400 |
| Runner diameter, in. approx | 150 | 150 | 150 |
| Submergency of runner, ft | 22 | ..... | 30 |
| Power to start pump, in air, kw approx | 2,000 | 2,000 | 2,000 |

## Table II—Efficiency of Pumping-Generating Cycle

| | Conditions | |
|---|---|---|
| | Favorable | Unfavorable |
| Efficiency of | | |
| Transmission, input | (1) | 95 |
| output | (1) | 95 |
| Pumping, site | 98 | 96 |
| pump | 91 | 89 |
| motor | 98 | 97 |
| Generating, site | 98 | 96 |
| turbine | 89 | 87 |
| generator | 98 | 97 |
| 100% less station uses | (2) | 99 |
| Accumulated product | 75% | 60% |
| Use as average efficiency | 66 2/3% | |

(1) With favorable location of plant relative to load and transmission, loading of lines off-peak and unloading on-peak as result of plant operation may reduce system losses.

(2) During generation, station uses of a large plant are negligible.

winter curve presents the most severe requirement, project design might be related to it initially. Indicated durations of generation will be needed in subsequent computations. For succesive increments of 100 Mw, these durations are about 26, 46, 62, and 72 hr.

### Separate Equipment Needed for High Heads

Relatively simple data on pump-turbine efficiencies and capacities are sufficient for preliminary studies. Although attention is directed primarily to characteristics of single-speed, reversible pump-turbines, suitability of other equipment should not be overlooked. The two-speed reversible unit is particularly well-adapted where variations in head are large compared to normal or average head available. For very high heads which are above the range of a reversible unit, the separate pump and turbine on a single shaft may be necessary. For somewhat lower heads, separate equipment may be justified by its higher efficiency and elimination of cost and operating problems associated with unit reversal.

Table I shows typical characteristics of a pump-turbine unit having a nominal 75-Mw capacity for a development with an average static head of 750 ft. Data are shown for the unit operating under average design head; under the same head but with reduced output; and under static head reduced about 5%. This variation in head, because of drawdown, is not unusual.

Of more interest than the absolute quantities of discharge and power is the pump-to-turbine discharge ratio, which is important in determining the required storage capacity. The higher the ratio, the more likely it will be that storage may be refilled in the limited pumping time available. To reduce storage requirements, it may be economical to use a unit with a high pump-to-turbine discharge ratio.

Storage capacity also may be reduced simply by limiting the capability rating to less than full-power capacity of the turbine and generator. This is illustrated in the second column of Table I. The pump-to-turbine discharge ratio is increased above 90%, but at a sacrifice of generator output.

Reduced generator capability, occasioned by part-load operation, is necessary only during periods requiring long durations of hydro generation. When the required generating load factor is lower and time for pumping ample, the unit or plant capability can be equal to maximum turbine output. Planning for unit capability which varies seasonally will probably result in a lower average cost per kw.

### Smaller Reservoir Can be Used

Overall efficiency of the pumping-generating cycle, based on reasonable assumptions as to transmission, site, and other losses, is shown in Table II. A range of efficiencies from 60 to 75% is indicated.

One big difference between a high-head pumped-storage and a conventional high-head plant is the size of the reservoir. Pumped-storage requires a considerably smaller reservoir, sufficient only for daily or weekly drawdown and refill. This difference permits use of pumped-storage in places entirely unsuitable for the usual hydro plant. This flexibility of location should allow other economies through use of shorter penstocks or tunnels and proximity to transmission.

Preliminary studies showed that pumped-storage hydro could be built for about $140 per kw. This cost,

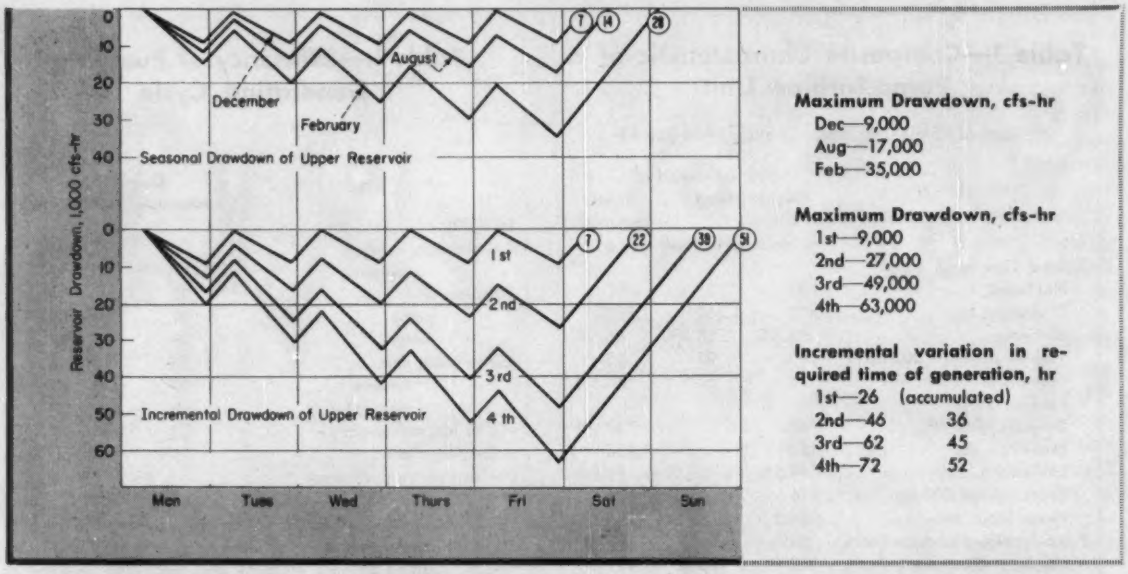



**FIG 3—RESERVOIR DRAWDOWN determines required storage capacity. Seasonal variations (upper) shows that drawdown for 100-Mw plant with 1,000-ft head is greatest in February. As successive 100 Mw units are added, incremental drawdown requirements (lower) becomes increasingly greater to provide for longer hours of use. Week-end refilling periods in hours are indicated by circled numbers on each curve. They represent pumping at full capacity**

much less than that of conventional hydro plants, is possible only because major savings can be made in the cost of dams and reservoirs, representing up to 75% of the total cost of a high-head plant. The pursuit of such savings largely determines the type of plant that may be developed.

### Pumping Time Is About 7.5 hr per Night

Pumped-hydro reservoir storage may be computed from load data, unit characteristics, and the assumptions discussed. Storage requirements are to be determined here for 100-Mw plants operating at 1,000-ft head, rather than 75-Mw units at 750-ft head. Assumed capacities for the turbine-generator are 1,400 cfs and 100 Mw; for the pump-motor, 1,250 cfs and 125 Mw. It is further assumed that time available for pumping averages 7.5 hr per night. Any additional week-end pumping time will have to be computed.

To illustrate computation of storage, consider first the seasonal variation in requirements at an average 100-Mw plant. As each increment of storage must be justified separately, consider also the incremental storage requirements for each 100 Mw in the total of 400 Mw. This incremental determination is made for the most severe winter load conditions.

Cycles of drawdown and refill are shown in Fig 3, first for the average 100-Mw plant operating on February, August, and December loads, and second, for each 100-Mw increment (in a total of 400 Mw) operating on the February loads. Maximum drawdowns are in cfs-hr, and times of week-end pumping needed to refill the upper reservoir are given. Week-end refills are shown as continuous periods of pumping at full capacity, although actual pumping would be at times and rates dictated by economy and availability of steam generation.

For a weekly operation cycle, maximum drawdown of the upper storage will occur on Friday evenings, after 5 days of generation and 4 nights of pumping. In February operation, the average 100-Mw plant will use 52 x 1,400 cfs in generation during 5 days and replace 30 x 1,250 cfs in pumping during 4 nights. Accumulated drawdown on Friday evening is therefore 35,000 cfs-hr, and 28 hr of week-end pumping will be required to refill the upper reservoir.

### Economics Improved by More Capacity

It will be noted that storage for February operation is twice that required in summer and four times that required in December. Because, in effect, a large portion of the required storage based on Feb. loads would be useful only during a brief period, overall economics should be improved by installation of additional capacity which makes most of the storage useful during most of the year. This is so even though the added capacity cannot be fully utilized as effective capability during several winter months.

Large variation in storage required for each increment of capacity also should be noted. Increasing storage need should be charged against successive increments of capacity in determining their economic justification. But this does not mean that any one plant must have as much storage as is indicated for the third and fourth 100-Mw increment. No one plant of 100-Mw capacity should have less storage than is needed for daily refill and no one need have more than the 63,000 cfs-hr required for the last 100-Mw increment.

Operation of the group of plants will be more flexible, and consequently more economical, under variations in operating conditions if storage at each plant, relative to its installed capacity, is about equal to or even in excess of the average requirement. Some reserve stor-

age capacity is desirable, if not necessary, particularly during the period of expected system peak loads. Such reserve is available automatically if average storage is adequate for winter operation.

A pumped-storage system needs two of these small reservoirs. When one is full, the other is empty, except for such dead storage as determined by reservoir configuration.

It is of interest to know how much drainage area will provide initially for 5,800 acre-ft of water. If the needed water can be accumulated over a period of at least one year during construction and average run-off from the watershed is 18 in. per year or more, the required drainage area will be only 6 sq miles. The reservoirs might also be filled by pumping from some nearby stream.

Suitable reservoir areas will usually mean fairly flat valleys closed off by low inexpensive dams or dikes and geologically adequate. The upper reservoir might be fairly small with considerable drawdown, but because of the deep submergence for the pumping units, the lower reservoir generally should have a relatively large area and limited drawdown. The flow line between reservoirs should be short.

**Table III—Determination of a Reasonable Value of Pumped-Storage**

| | | |
|---|---|---|
| Annual Cost per Kw of Gross Steam Capacity | | |
| Fixed charges, 12.5% x $140 | | $ 17.50 |
| Operation and maintenance (excluding Fuel) | | 2.50 |
| | | $ 20.00 |
| For steam equivalent to one kw of pumped-storage, 1.1 x $20.00 | | $ 22.00 |
| Annual Operating Costs per kw of Pumped-Storage* | | |
| Operation and maintenance | $ 1.00 | $ 1.00 |
| Production cost penalty | 1.00 | 4.00 |
| Balance available for hydro fixed charges | $ 20.00 | $ 17.00 |
| Possible Investment per kw of Pumped-Storage | | |
| For initial 100 Mw, 12% fixed charges | $167.00 | ..... |
| For subsequent unit, 12% fixed charges | ..... | $142.00 |

*Assuming two different production cost penalties—for an initial installation and for some subsequent unit.

### More Fuel Would be Used

Operation of a pumped-storage plant as an alternative to a new steam unit will almost certainly result in the use of more fuel, and hence higher system production costs. Pumped-storage energy may replace high-cost steam energy on the load curve and thus result in some savings from operations. However, a new steam unit would replace even more of this high-cost energy and do it at lower cost. As compared to alternative steam units, the second and successive pumped-storage units results in higher and higher production costs.

Effect of pumped-storage on production costs in the GPU system is influenced by hydro plant location and whether it is assumed to replace new steam generation in an area of high- or low-cost fuel. In place of specific results, it will be assumed that each kw of pumped-storage capacity results in an increase in annual system production costs of $1 or $4 per kw.

To determine the value of pumped-storage, the basic estimate is the cost for alternate steam capacity, taken at $140 per kw of gross capability. Some difference between fixed charges for hydro and steam developments results from a difference in expected useful life. On a present-value basis, difference in depreciation costs will be at least 0.5%, some of this offset by higher income taxes. For the computation, 12.5% will be used for steam and 12% for hydro fixed charges.

A fixed operating cost of $2.50 per kw per year is reasonable for modern steam units. For hydro, an estimate of $1 per kw per year for a plant of 100 Mw or more capacity, though somewhat high, will be used. Published information indicates the average availability of modern steam units is 90 to 92%, and experience indicates a much higher availability for hydro units. Because additional capacity must be installed to take care of the normal unavailability of steam capacity, it is reasonable to assume that 1 kw of hydro replaces more than 1 kw of steam. Gross steam capacity also must be reduced by an allowance for station use; hydro-plant station use is negligible. Thus, 1 kw of installed hydro capacity will be assumed to replace 1.1 kw of gross steam capacity. Transmission costs are omitted from this comparison.

On the basis of these elements, a reasonable value of pumped-storage is estimated in Table III. The only element adverse to hydro is the production cost penalty, which is almost directly a function of fuel cost. In a low-cost fuel area the penalty would be very low. Thus, pumped-storage may be justified more readily in a low-cost fuel area.

The difference between the $167 per kw and $142 per kw is indicative of the decreasing value of successive increments of pumped-storage. Reservoir storage requirements indicate a probably higher cost of construction for successive capacity increments. Where these curves of value and cost cross will indicate the limit of pumped storage that is justified.

### Other Advantages to Consider

Feasibility and economics of pumped-storage may be enhanced through consideration of these several unevaluated factors which are characteristic of hydro generation:

**1.** Large reactive capacity is available for voltage regulation.

**2.** Cost of spinning reserve is practically zero.

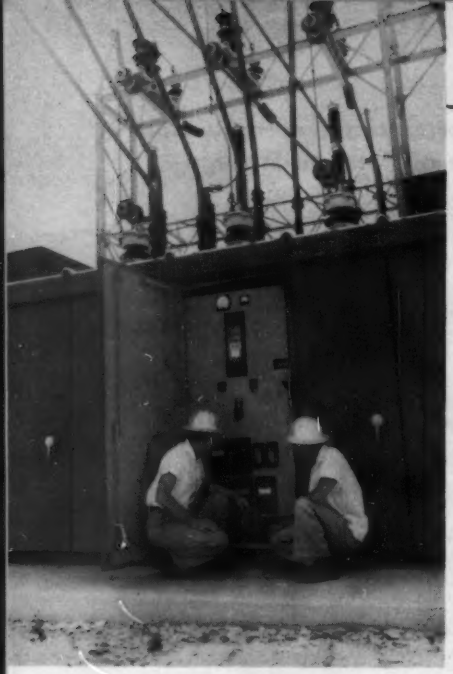
**3.** Load pickup or load drop is relatively rapid, and operation at variable load results in little loss in economy.

**4.** Economy of base-loaded steam plants is improved, as is service reliability through avoidance of stops and starts.

**5.** Location may be possible where steam is impractical, in sizes that would be uneconomical for steam.

**6.** Smaller units give better opportunity for fitting capacity to load.

**7.** Units may be added to a developed site with relatively short lead time.



# Coordinated Relaying Protects Processing

**Pilot-wire and differential relays, combined to protect continuous-process area, afford highest service reliability consistent with single supply source; process area has its own transformers and distribution system**

**GEORGE O. HUNT,** Plastics Division, Monsanto Chemical Co, Texas City, Texas

Differential and pilot wire relays are combined to protect a new continuous-process area at the Monsanto plant here, giving to the area the highest reliability consistent with a single supply source. A 66-kv switching station has been incorporated in the distribution system, where it separates the new area from the older power system.

This considerable investment in reliability was justified because of the expense of disassembling and cleaning equipment, even when an outage is momentary.

### Unit Substations Used

The area has its own primary power transformers and a complete secondary distribution system. Unit substations, individually protected, help isolate faults in local units. The entire protective system is coordinated with the utility company's feeder protection not only to assure satisfactory supply but also to facilitate breaker testing.

The principal load in the new area consists of several large, 500-hp class, synchronous motors, 400 to 500-hp induction motors, 50 to 200-hp induction motors, and many small induction motors. Several variable-speed drives and a 115-v system for lighting and instrumentation complete the load. The large induction and synchronous motors are served at 4,160 v; the medium-sized motors at 440 v.

### Service Isolated

Community Public Service Co supplies power to the plant from a 66-kv bus fed by two circuits. Monsanto is served through a single 66-kv breaker. Other breakers supply several other customers.

In the plant distribution system before the new plant addition, as shown in Fig 1, there were two transformers tapped from a single radial feeder. To provide the necessary service continuity for the new facilities, a separate transformer station (No. 3) was installed, and the service to it was isolated from the older transformer stations by construction of a 66-kv switching station, Fig 2.

### CT's Are Bushing Type

Three battery-trip, pneumatically operated branch breakers—one for each substation—were tapped off the 66-kv bus. Each is equipped with overcurrent and grounding overcurrent relays. The circuit breakers have current transformers of the bushing type. The breaker bus structure has provisions for the installation of two additional breakers. Installation of three 66-kv breakers permitted removal of the fuses on the primary of each of the two original transformer stations.

Each transformer station has a remote control unit for the corresponding 66-kv circuit breaker, and remote control and remote tripping circuits are carried in multi-conductor aerial cable on the pole lines.

### Protection Coordinated

To coordinate its protection system with that of Community Public Service, Monsanto provided bus differential protection around its own switching station and the utility's main breaker. Similarly, Community Public Service removed its instantaneous trip attachments. Now the percentage differential relays are on the utility's property and operate the Monsanto breaker in the utility's substation. This protection provides very fast relay action and clearing of a line fault.

Each 66-kv breaker has conventional isolation and bypass switches. Breaker testing is coordinated with the utility, so that the instantaneous trip attachments on Monsanto's breakers can be activated during testing. Switches on the operating handles of the Monsanto breaker bypass switches open the trip circuit of the percentage differential relay for breaker testing.

The new production area is so arranged that it can operate at re-

duced capacity. Accordingly, two 66/4.16-kv transformers, each with approximately half the total capacity required, were installed in Station 3. This arrangement makes it possible to service one transformer while the plant continues operation. The two transformers supply a 4.16-kv loop feeder which serve the new area.

The two 5-Mva transformers are connected delta on the high side, wye on the low side. Secondaries are grounded through a 2.4-ohm resistor which restricts 4.16-kv ground faults to 1,000 amp. From the 66-kv supply, faults between two phases are limited to 36 amp which is not enough to pick up the 66-kv, 3-phase relays. This limitation provides a good time margin, assuring good selectivity from the ground relay connections.

### Has Three Load Centers

The total current from the secondaries of the current transformers on the two transformer breakers operates an overcurrent relay which trips both the transformer breakers and the 66-kv breakers at the switching station. Sudden pressure relays were applied to the transformer cases to reduce transformer damage caused by internal faults. The system up to the main transformer station bus is shown in Fig. 2.

A study of the process and plot plan indicated the area could be served best by three load centers. The distribution system for these centers is shown schematically in Fig. 3.

The circuits are overhead, open-wire construction, with two, 350-Mcm bare conductors per phase.

At the load center points, the line is brought down the pole by copper pipe and into the building by cable in conduit. Sectionalizing breakers are included in the switchgear line-up in the buildings.

### Distance Is 650 Ft

Starting clockwise around the 4.16-kv loop, Fig 3, the distance from the new No. 3 transformer station to the first load center, substation A, is 650 ft. Since this is a little far for percentage differential relays, high-speed, single-moving-element pilot wire relays were employed. Overcurrent and grounding overcurrent relays on the branch breaker provide back-up protection. The pilot wire combination will clear breakers (a) and (b) if a fault occurs on that section of the distribution line.

To protect against a fault in substation A, the total current from the current transformers around the breakers that feed substation A is run through an overcurrent and a grounding overcurrent relay. Operation of this set will open breakers (b) and (c).

Since the distance between substations A and B is only 350 ft, this section of the loop is protected by percentage differential relays. Breakers (c) and (d) open when these relays operate. A totalized current transformer current arrangement identical with that in substation A is used for protection against substation faults. The 200-ft distribution run between substations B and C is protected by another percentage differential relay which opens breakers (e) and (f) on operation. Substation C uses the same system for protection against internal faults as the substations A and B. This set controls breakers (f) and (g).

### Back-up Provided

Completing the loop, the distance from substation C to the No. 3 transformer station is 1,200 ft, too far for percentage differential relays.

This section of the plant's distribution system is protected by pilot wire relays whose operation opens breakers (g) and (h). Overcurrent and grounding overcurrent relays fur-

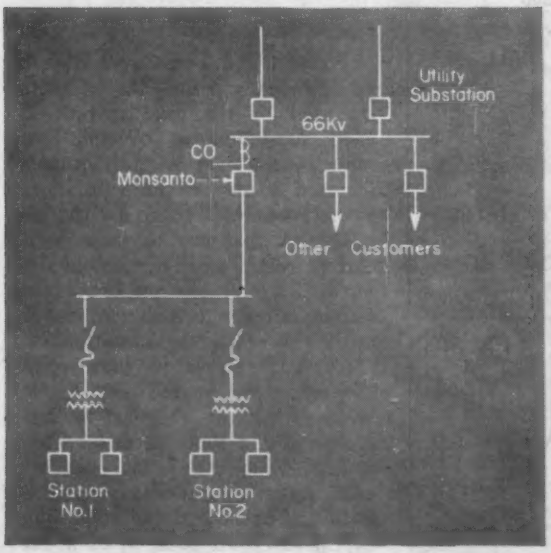



**FIG 1—BEFORE ADDITION plant comprised two substations which were served from 66-kv bus supplied by two feeders. One utility breaker protected the plant**

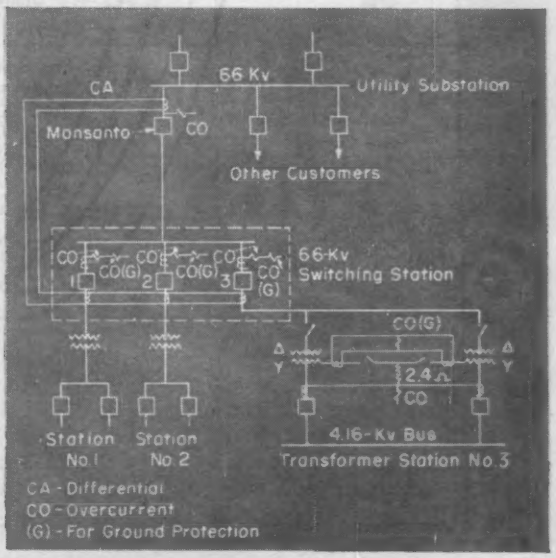



**FIG 2—66-KV SWITCHING STATION was built to isolate the service to new production area. Bus differential relays coordinate plant protection with utility's**

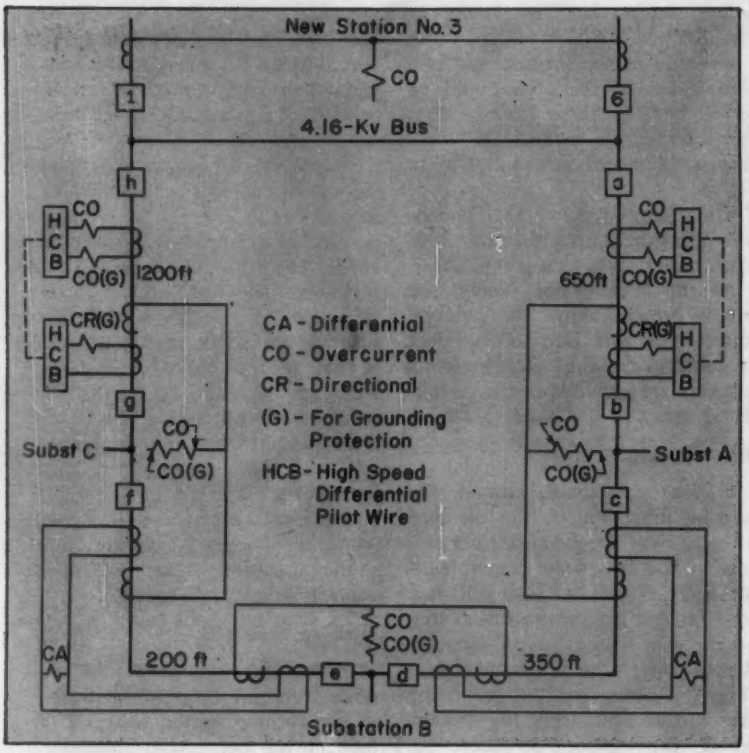



**FIG 3—NEW AREA has three substations, served from 4.16-kv loop. Pilot wire relays protect bus where run is too great for percentage differential type**

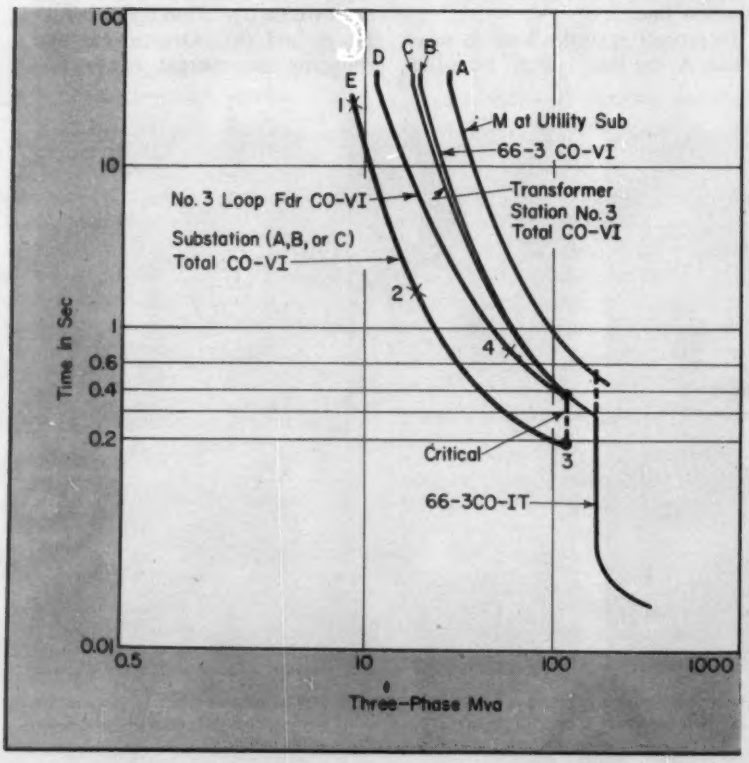



**FIG 4—CRITICAL POINT for 66-kv station No. 3 and loop feeder relays is established by the 120-Mva fault value for 4.16-kv phase-to-phase short circuits**

nish back-up protection on breaker (h).

Coordination of the protective scheme and the time-power characteristics of the breaker relays is shown in Fig 4. Because the distribution lines are very short, line reactance offers very little limitation to fault currents.

The setting of the utility breaker on the 66-kv line feeding the Monsanto plant, Curve A, is the maximum that will permit coordination with other breakers on the utility's system. A phase-to-phase short on the 4.16-kv circuit will draw about 120 Mva through the two 5-Mva, 6.94-ohm impedance transformers.

### Set to Trip at 0.4 Sec

To prevent a fault in one area from tripping the main breakers on the utility's feeders and interrupting service to the entire Monsanto plant, the 66-kv breakers in the switching station were set to trip at 0.4 sec for 120-Mva faults. This critical point establishes Curve B, the time-power characteristic of these breakers.

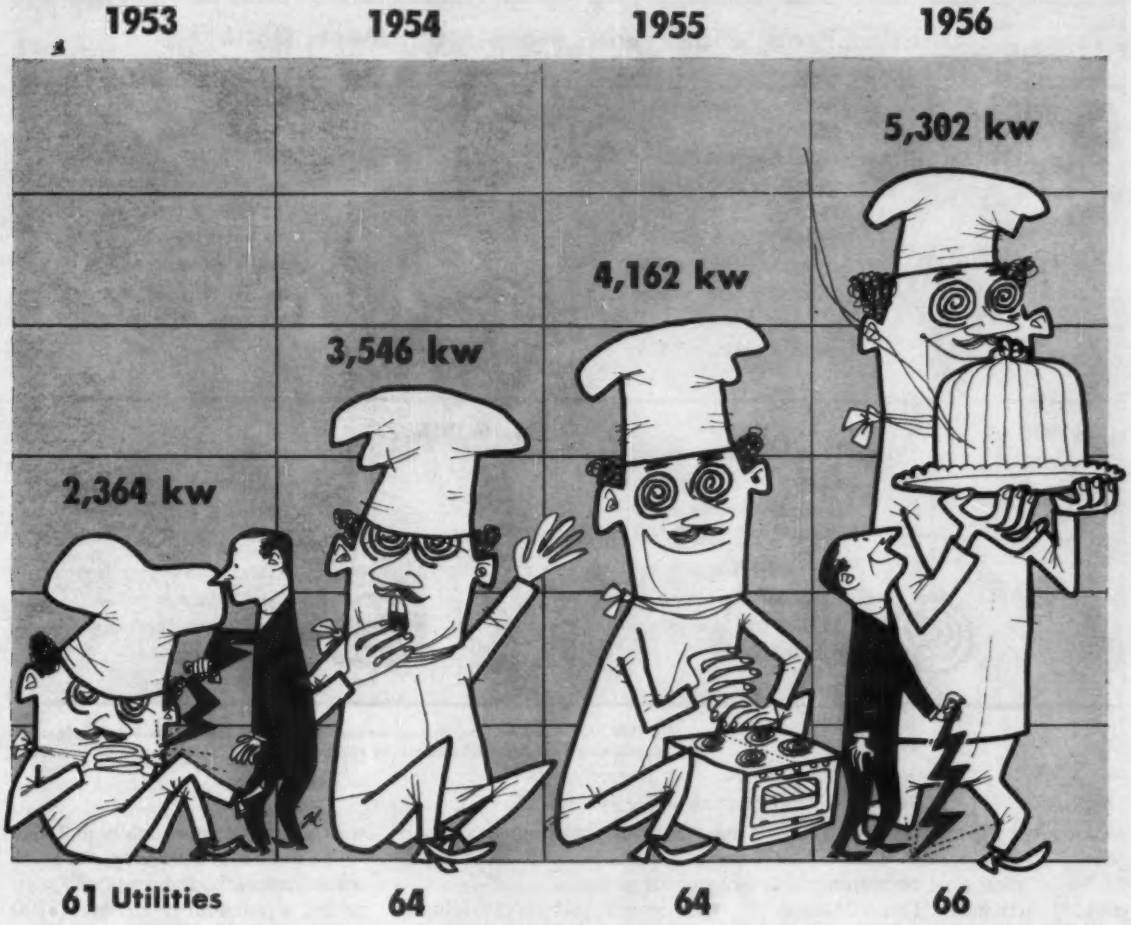
Either the overcurrent relays on the 66-kv switching station breaker or those on the No. 3 transformer station total will trip the switching station breaker. Consequently, Curve C, which represents the No. 3 transformer station, may fall along the same line as Curve B.

### Protect Station Bus

Points 1 and 2 on Curve E were established to permit the breakers operated by the total current at each substation to override the branch protection with the superimposed loads on the substation. Point 3 was established by the requirement that any of these total current relays must trip within 0.2 sec after a fault occurred in its substation in order to maintain service at the two remaining substations.

Curve D represents the No. 3 loop feeder overcurrent relay. These breakers protect the station bus against severe short circuits on the system while the primary differential relays are out of service. The lower end of the curve is established by Curve E. At point 4, or about 60 Mva, some spread could be given between D and C.

From that point down to lesser faults, some degree of selectivity could be obtained.




# Utilities Awaken a 'Sleeping Giant'

- Average new cooking load added was 5,302 kw, 27% over 1955
- Utilities boosted both manpower and money in racking up this gain
- Prime target is new construction, skirting adequate wiring bottleneck

Commercial electric cooking, from a utility's load standpoint, is a "sleeping giant." That it is slowly being awakened and tapped by the power companies as an increasingly important source of business is reflected in the chart above. Although this year's survey reveals no companies promoting now that were not doing so last year, the money and manpower they're expending has been steadily boosted.

Average kw added among this year's 66 surveyed companies was 5,302, up 27% over 1955 (see chart). To get this, utilities:

- Upped average commercial cooking expenditures (including salaries) from $22,302 (for 27 companies) in 1955 to $25,689 (for 30 companies) in '56.
- Spent $13.62 per food service customer and 34¢ for each $1 of commercial cooking EAR in 1956. In '55 these were $13.30 and 26.5¢.
- Spent 2.13 man-years per 1,000 food service customers compared to last year's 1.9 man-years per 10,000 commercial-industrial accounts. (Here a word of explanation is necessary: It had been assumed in previous years that one in 14 commercial-industrial accounts was a food service customer. This assumption has not always proved reliable, usually because of the variations of the respective service areas. This year's survey uses a "weighted" value to determine the percentage of commercial-industrial accounts that are food service operators.)
- Employed 1.9 commercial

## Utilities Prod 'Giant' with more Manpower, Dollars

**In 1955...**

Spent 1.5 Man-years per 10,000 commercial-industrial customers*
Employed 1.1 commercial cooking specialists plus 16 all-purpose representatives who spent 24.3% of their time on commercial cooking activities

**and in 1956...**

Spent 2.13 Man-years per 1,000 food service customers*
Employed 1.9 commercial cooking specialists plus 19.6 all-purpose representatives who spent 24.9% of their time on commercial cooking activities

**In 1955...**

Average commercial cooking expenditure (including salaries) among 27 companies was
**$22,302**
They spent $13.30 per food-service customer, and—
26.5¢ for each $1 of commercial cooking EAR

**and in 1956...**

Average commercial cooking expenditure (including salaries) among 30 companies was
**$25,689**
They spent $13.62 per food-service customer, and—
34¢ for each $1 of commercial cooking EAR

*In 1955, it was assumed that approximately 1 in 14 of all commercial-industrial meters represented a food-service customer. In 1956, a "weighted" system was used (see text).

cooking specialists plus 19 all-purpose representatives who spent 24.9% of their time on commercial cooking activities. This compares to last year's 1.1 specialists and 16 all-purpose men who spent 24.3% of their time on cooking.

Revenues also are up. Using $25 return per kw, average annual revenues have been jacked an estimated $132,550.

Based on previous surveys, the 12-year average added load since the end of World War II has been estimated at 2,260 kw per year; this is only a little more than 40% of the 1956 rate. The 12-year average of installed kw per food service customer is approximately ⅔ kw. For this year, the installed kw per "weighted" food service customer averages 2.18, or more than three times that average.

### Modern Operators Cause Surge

The big upswing in the commercial cooking load is attributed to the coming of age of the modern food service operator as a major consumer of electricity. To give some idea of the food service operator's place in the economical scheme of things:

- He served 28 billion meals last year worth $18 billion, $2 billion more than the auto industry.
- He makes up the country's second largest industry in number of retail outlets and first in number of employees.
- He's expected to do $35 billion worth of business annually in 1970.
- He offers, according to Electrical Industry Publications' estimates, a potential in EAR of $800 million 40 billion kwhr.

C.C.-minded utilities have been moving in on this potential. Pennsylvania Power & Light Co is an example par excellence. PP&L, one of the first to move into the $1 million class, stands alone now with

### THE TOP 10 IN 1956

| | Over 200,000 Meters | | Under 200,000 Meters | |
|---|---|---|---|---|
| | Company | New Load | Company | New Load |
| 1. | So. Calif. Edison | 18,612 kw | Idaho Power | 6,364 kw |
| 2. | PP&L | 17,122 | Atlantic City Elec. | 5,858 |
| 3. | Appalachian | 16,742 | Potomac Edison | 3,856 |
| 4. | Georgia Power | 14,417 | Toledo Edison | 3,662 |
| 5. | Ohio Power | 13,326 | Wisconsin P&L | 3,609 |
| 6. | Duke Power Co. | 12,909 | Washington Water Power | 3,448 |
| 7. | Carolina P&L | 12,465 | Kentucky Power | 3,169 |
| 8. | Texas P&L | 11,436 | Indianapolis P&L | 2,633 |
| 9. | New England Elec. Sys. | 11,215 | Kansas G&E | 2,575 |
| 10. | Ohio Edison | 9,934 | Minnesota P&L | 2,251 |

an annual commercial cooking business of more than $3 million! The over-$2 million class includes three long-time promoters: Appalachian Electric, Ohio Power, and Southern California Edison. And the more than ten companies make up the more-than-$1 million roster.

Commercial cooking results are cumulative. This is well backed up by the names of long-time classic promoters in the "Top 10." In the over-200,000-meter class, Southern California Edison lead the parade with 18,612 kw of new cooking load. In the under 200,000 meter group, top dog was Idaho Power with 6,364 kw.

### Basic Points for C.C. Program

Leading companies all seem to build their programs around several basic points, to wit:

- Above-average budgets.
- Aggressive sales activities, centered around (1) people whose knowledge of cooking is more than theoretical, and (2) the principle of equipment demonstration.
- Enthusiastic top management support.

Judging from average figures, which admittedly do not reflect an entirely accurate picture because so many companies are unable to report budgets, companies are puting a bigger chunk of their promotional dollars into cooking activities.

Biggest single word in selling equipment is "demonstration." Depending on the nature of their territories, companies have devised techniques for showing prospective customers what equipment can do. In areas with heavy customer concentration, companies bring them to the show. Those utilities having a low number of prospects per sq mile, must take the show to the customers. Potomac Ed does it with its "Commercial Cooking Cruiser" —a bus outfitted with C. C. equipment. Wisconsin Power & Light uses its "Fiesta" technique. (see page 98).

### Service, But No Merchandising

About 40% of the utilities service equipment (it becomes an indispensable part of their promotion); most do not merchandise. Here the trend toward dealer cooperation, as spotted in last year's survey (EW, Aug. 27, 1956, p 36), has been heightened. Of the 66 companies in the survey, 64 or 94% furnish leads to area dealers or have a representative accompany dealer salesmen on calls; one does it partially, and only one utility does not.

Some 24 sales methods are used by utilities in pushing their commercial cooking loads. Only 22 of these are shown on the survey tabulation beginning on page 85. Space limitation is the reason for omission. The two promotional methods left out cover activities in instructing purchasers on the use and care of their equipment and the maintenance of photo and testimonial files. In both cases an overwhelming majority (62 for the first, 56 for the second) do these.

Program quotients and index numbers, both measures of the efficiency of the respective programs, were omitted from the published results to make room for a new section—Load Analysis. This section indicates just where power companies are picking up their cooking loads and consequently where they should concentrate their efforts. The best commercial cooking pickings are in the new construction field. Turn the page to find out why.

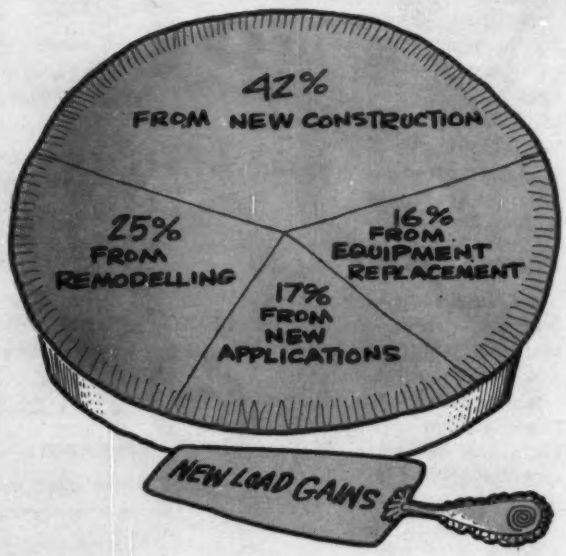
## How Does Your Company Stack Up on Commercial Cooking?

**Rate your company's policies and plans against this tabulation made from the 1957 Commercial Cooking Survey of 66 utilities**

| Policies | Do | Don't | Partially | Your Company |
|---|---|---|---|---|
| Survey customers and revise annually | 42 | 23 | 1 | ☐ |
| Have mailing list of all food service accounts and revise it annually | 50 | 13 | 3 | ☐ |
| Have counter equipment for demonstration and "loaner" purposes | 48 | 17 | 1 | ☐ |
| Have heavy-duty equipment for demonstration and "loaner" purposes | 26 | 36 | 4 | ☐ |
| Service equipment | 44 | 17 | 5 | ☐ |
| Subscribe to and follow-up "Dodge-Reports" | 34 | 30 | 2 | ☐ |
| Provide kitchen layout service | 37 | 24 | 5 | ☐ |
| Have incentive plan for utility representatives | 15 | 51 | 0 | ☐ |
| Offer wiring subsidy | 10 | 56 | 0 | ☐ |
| Finance wiring | 6 | 66 | 0 | ☐ |
| **Programs** | | | | |
| Conduct annual commercial cooking training for their representatives | 58 | 8 | 0 | ☐ |
| Work with dealers (furnish leads, make calls with dealer salesmen, etc) | 64 | 1 | 1 | ☐ |
| Contact all prospects semi-annually | 51 | 12 | 3 | ☐ |
| Contact key architects quarterly | 53 | 11 | 2 | ☐ |
| Use direct mail advertising at least quarterly | 50 | 12 | 4 | ☐ |
| Offer free trial installations of counter equipment | 49 | 16 | 1 | ☐ |
| Offer free-trial installations of heavy-duty equipment | 17 | 40 | 9 | ☐ |
| Hold group prospect meetings at least twice a year | 42 | 21 | 3 | ☐ |
| Stage spring and/or fall sales campaigns | 44 | 21 | 1 | ☐ |
| Have incentive plan or special activity for dealer salesmen | 23 | 43 | 0 | ☐ |
| Mail "Food Service" magazine to a minimum 30% of food service accounts | 58 | 6 | 2 | ☐ |
| Display equipment and/or have model kitchen | 31 | 33 | 2 | ☐ |

# Biggest Load Is in New Construction

- **Studies show that it has up to 42% of the commercial electric cooking business, yet it constitutes only 5% of the market**
- **By aiming their promotions at it, utilities can skirt the inadequate wiring bottleneck**




Possibly the most important finding to come out of this year's Commercial Cooking Survey is that new construction offers the ripest plum for added load.

Of the 56 utilities reporting the breakdown of their cooking load gains, the average was 42% from new construction. Remodeling followed as a poor second with 25%. Replacement and new applications averaged 16 and 17% respectively.

This is as it should be. Reason: Inadequate wiring is as big if not a bigger bottleneck for boosting commercial cooking sales as it is in residential sales. In a recent study of 1,988 restaurants in its area, Philadelphia Electric Co found that only 5% of the eateries were wired for 200 amp and a mere 1% for any load above that. To complete the picture, more than half of the Philadelphia restaurants (54%) had only 60-amp wiring, or less than what the industry generally accepts for today's residential standards. Another 10% had 30-amp service entrances. Only 30% had 100-amp.

But the inadequate wiring bottleneck can be broken, and indeed, is being broken. Electrical Industry Publications, in a study of 66 restaurants, 80% of which had some electric commercial cooking, found that service entrances can be upped. Here's how they stack up:

- The 30 and 60-amp entrances are eliminated completely.
- The 100-amp percentage dropped from 30 to 13.2%.
- The 200-amp entrance jumped from 5 to 17.4%.
- The 400-amp entrance (Above 200-amp in the Philadelphia Electric study) was boosted from 1 to 26.5%.
- The 600 and 800-amp services entrances come into the picture with 22.1 and 20.6%, respectively.

### New Construction Is the Real Plum

But the real plum is in new construction, where the wiring problem doesn't exist, no matter how great the service entrance requirements.

Hotpoint Co's Utility Management Guide to Commercial Electric Cooking put the new building market at some 33,000 buildings a year (1955-56) with a total project value of $20 billion. These include construction suitable for commercial cooking facilities, i.e., schools, churches, hospitals, industrial buildings with kitchens, hotels, motels, restaurants, and military installations.

The evidence that new construction is the prime target for utilities in commercial cooking promotion has been underscored in another E.I.P. study of the 16 companies represented on Edison Electric Institute's Commercial Cooking Committee. In this one, the 16 companies added 71.670 kw of new cooking load, broken down as in the following sources:

- New construction, 45%
- New applications, 24%
- Remodeling, 21%
- Replacement, 10%

These figures are of the same magnitude as in the EW survey. As 95% of all commercial cooking outlets are in existing structures, 42 to 45% of the new business is in 5% of the market! That utilities should go after this 5% most aggressively seems obvious.

### How They Go After It

Much of the secret of success in selling this new construction market lies in wooing architects and consulting engineers responsible for construction projects. A heavy percentage (80%) of the surveyed utilities contact their area architects quarterly.

**On the following four pages 66 utilities tell what they do to boost cooking load . . .**

# Commercial Cooking: What Utilities Do to Sell It

| ORGANIZATION | Idaho Pwr. | Tex. P&L | I&M Elec. | Gulf States | Appl. Elec. | Ken. Pwr. | Minn. P&L | Chat. P. B. | Wash. W. P. | Atl. City | Ohio Pwr. | Knox. Util. | Ga. Pwr. | Car. P&L | Duke Pwr. | Pot. Ed. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Yrs CC Promoted | 28 | 8 | 20 | 5 | 8 | 27 | 20 | 18 | 41 | 8 | 25 | 20 | 26 | 21 | 7 | 32 |
| Merchandises CC (% territory) | None | None | None | None | None | 100 | 35 | None | None | 100 | None | None | None | None | None | 100 |
| Comm Meters (1,000) | 15.8 | 37.5 | 24.7 | 30.2 | 51.3 | 10.4 | 7.9 | 7.03 | 14.5 | 23.2 | 47.7 | 7.2 | 55.8 | 38.4 | 63.9 | 17.6 |
| Ind Meters (1,000) | 80 | 6.9 | 1.57 | 2.4 | 3.4 | 1.3 | 536 | 826 | 707 | 482 | 2.8 | 475 | 15.6 | 1.99 | 1.2 | 241 |
| Food Serv Cust (1,000) | 0.45 | 1.8 | 144 | 1.16 | 4.08 | 725 | 570 | 650 | 825 | 1.62 | 3.2 | 1.2 | 4.7 | 3.8 | 3.4 | 1.4 |
| No. CC Specialists | 4 | 0 | 0 | 0 | 5 | 3 | 0 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 0 | 1 |
| No. All-Purp. Reps | 11 | 37 | 36 | 19 | 21 | 5 | 8 | 3 | 12 | 8 | 48 | 5 | 31 | 8/20 | 6 | 7 |
| /% Time on CC | 25 | 30 | 20 | 20 | 20 | 30 | 30 | 5 | 20 | 25 | 25 | 20 | 25 | 100/50 | 60 | 33 1/3 |
| Man-Yrs per "Weighted" F.S. Cust | 5.90 | 4.87 | 3.84 | 2.45 | 2.26 | 5.75 | 4.00 | 1.99 | 3.59 | 1.23 | 3.56 | 4.10 | 1.77 | 5.57 | .91 | 2.49 |
| **BUDGET** | | | | | | | | | | | | | | | | |
| Sales Exp ($1,000) | 34.0 | N.A. | N.A. | N.A. | N.A. | N.A. | 16.2 | 10.8 | N.A. | 28.0 | N.A. | 17.0 | 58.7 | NA. | N.A. | N.A. |
| Sales Exp/Cust—($) | 29.96 | N.A. | N.A. | N.A. | N.A. | N.A. | 26.9 | 42.6 | N.A. | 17.2 | N.A. | 23.3 | 11.9 | N.A. | N.A. | N.A. |
| Avg Sales Exp ¢/$ of CC EAR | .27 | N.A. | N.A. | N.A. | N.A. | N.A. | .24 | .25 | N.A. | .24 | N.A. | .30 | .48 | N.A. | N.A. | N.A. |
| **POLICIES** | | | | | | | | | | | | | | | | |
| Survey Customers | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | No | No | Yes |
| Use Mailing List | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | No | Yes |
| Dem/Loaner Counter Equip | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | Part. | Yes | Yes | Yes | Yes | Yes | No | Yes |
| Dem/Loaner Heavy-Duty Equip. | Yes | Yes | Yes | Part. | No | Yes | No | No | No | No | Yes | Yes | No | Yes | No | Yes |
| Service Equip | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes |
| Followup Dodge Rpts. | No | No | No | Yes | Yes | No | No | Yes | No | Yes | No | Yes | Yes | Yes | Yes | No |
| Kitchen Layout Serv. | No | No | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | No | No | No | Yes |
| Incentives for Reps | No | No | Yes | Yes | No | No | No | No | No | Yes | Yes | No | No | No | No | Yes |
| Wiring Subsidy ($/Kw) | No | No | No | $5 | No | No | No | $4 | No | $5 | No | No | No | No | No | $4 |
| Finance Wiring | No | No | No | No | No | No | Yes | No | Yes | No | No | No | No | No | No | No |
| **PROGRAM** | | | | | | | | | | | | | | | | |
| Annual Rep Training | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Dealer Cooperation | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| See Cust Twice Yr | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No |
| See Archts Quarterly | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Direct Mail Quarterly | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Free Trials—Counter Equip | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | No | Yes | Yes | No | Yes | Yes | Yes | Yes |
| Free Trials—Heavy-Duty Equip. | Yes | Yes | Yes | Yes | No | Yes | No | No | No | No | Yes | No | No | Part. | Yes | Part. |
| Prospect Meetings (min twice yr) | No | Yes | Yes | Yes | Yes | Yes | No | No | No | Yes | Yes | No | Yes | Yes | Yes | No |
| Spring/Fall Drives | Both | All-Yr. | Spr | Both | Yes | Yes | Spr. | No | Spr. | Spr. | All-Yr. | No | Spr. | Spr. | No | Spr. |
| Dealer Incentives | No | Yes | No | No | No | No | No | Yes | No | Yes | Yes | Yes | Yes | Yes | No | No |
| Mail "Food Service" to 30% of Cust | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Part. | Yes | No | Yes |
| Display Equip/ Model Kitchen | No | Yes | Yes | Yes | Yes | Yes | Yes | No | No | Yes | Yes | No | Yes | Yes | Yes | Yes |
| **RESULTS** | | | | | | | | | | | | | | | | |
| CC Kw Added—1956 | 6,364 | 11,424.3 | 9,264 | 6,794 | 16,743 | 3,169 | 2,250 | 2,200 | 3,438 | 5,859 | 12,001 | 2,600 | 17292.9 | 11,172 | 12,909 | 3,856 |
| CC Kw Added—1955 | 3,486 | 10,396.2 | 6,619 | 5,354 | 15,360 | 2,405 | 2,321 | 1,700 | 3,495 | 8,726 | 12,033 | 2,800 | 11,124 | 10,617 | 11,540 | 4,607 |
| 1956 CC EAR ($1,000) | 127.3 | 456.97 | 231.6 | 169.9 | 418.6 | 80.0 | 67.5 | 44.0 | 56.6 | 117.2 | 211.8 | 5.6 | 121.2 | 223.4 | 322.7 | 96.4 |
| Est CC Kw Added—1946–1956 | 25,000 | 46787.9 | 40,456 | 22,211 | 105810 | 17,875 | 16,303 | 19,038 | N.A. | 46,859 | 85,406 | 2,600 | 70,018 | 65,000 | 51,435 | 36,602 |
| CC Kw Added per "Weighted" Cust. | 5.61 | 5.01 | 4.95 | 4.37 | 4.13 | 4.05 | 3.75 | 3.64 | 3.63 | 3.59 | 3.57 | 3.56 | 3.51 | 3.45 | 3.27 | 2.91 |
| **LOAD ANALYSIS** | | | | | | | | | | | | | | | | |
| % from New Const. | 35 | 30 | 52 | 40 | 35 | 65 | 55 | 25 | 35 | 30 | 40 | 46 | 50 | 35 | 50 | 30 |
| % from Remodeling | 40 | 5 | 23 | 35 | 35 | 35 | 35 | 40 | 35 | 30 | 25 | 25 | 20 | 15 | 25 | 40 |
| % from Replacement | 10 | 45 | None | None | None | 10 | None | 15 | 15 | 25 | 15 | 15 | 20 | 20 | None | 15 |
| % from New Appl. | 15 | 20 | 25 | 25 | 30 | 15 | 10 | 20 | 15 | 15 | 20 | 14 | 10 | 30 | 25 | 15 |

## 3rd Commercial Cooking Survey

| ORGANIZATION | Seat. City | Tel. Ed. | Penn. P. &L. | Omaha P. D. | Nash. P. B. | West Penn. | Met. Ed. | Utah P. &L. | Ohio Ed. | Kans. G. &E. | North. States | N. E. Elec. | Okla. G. &E. | S. M. U. D. | Wisc. P. &L. | Wisc. P. S. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Yrs CC Promoted | 5 | 10 | 10 | 33 | 17 | 25 | 22 | 26 | 20 | 6 | 6.5 | 14 | 17 | 3 | 10 | 21 |
| Merchandises CC (% territory) | 100 | None | None | 100 | None | None | None | None | None | None | 25 | 44 | None | None | 100 | 100 |
| Comm Meters (1,000) | 21.9 | 17.4 | 82.7 | 11.0 | 12.4 | 33.0 | 26.9 | 18.9 | 56.4 | 15.2 | 72.0 | 73.0 | 36.05 | 12.7 | 22.6 | 15.3 |
| Ind Meters (1,000) | 281 | 2.6 | 5.4 | 768 | 700 | 4.7 | 2.7 | 3.3 | 900 | 1.7 | 1.7 | 3.8 | 597 | 2.2 | 217 | 922 |
| Food Serv Cust (1,000) | 1.5 | 1.2 | 6.0 | 562 | 1.2 | 2.6 | 1.9 | 1.5 | 4.8 | 1.08 | 4.5 | 5.4 | 2.9 | 1.0 | 2.0 | 779 |
| Has CC Specialists | 3 | 2 | 3 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 7 | 5 | 1 | 1 | 1 | 0 |
| No. All-Purp. Reps /% Time on CC | 21–0 | 4–0 | 44–30 | 12–5 | 3–5 | 18–20 | 15–20 | 17–20 | 27–5 | 13–18 | 20–10 | 44–10 | 9–20 | 3–30 | 23–9 | 12–30 |
| Man-Years per "Weighted" Food Service Cust | 1.96 | 1.55 | 2.66 | 2.37 | 1.10 | 1.77 | 1.47 | 2.15 | .76 | 2.94 | 1.83 | 1.71 | 1.03 | 1.86 | 1.70 | 3.78 |
| **BUDGET** | | | | | | | | | | | | | | | | |
| Sales Exp ($1,000) | N.A. | 17.4 | N.A. | 10.6 | N.A. | N.A. | N.A. | N.A. | None | 21.0 | N.A. | 66.5 | 50.0 | 11.8 | N.A. | N.A. |
| Sales Exp/Cust—($) | N.A. | 13.47 | N.A. | 15.73 | N.A. | N.A. | N.A. | N.A. | N.A. | 18.68 | N.A. | 12.12 | 18.42 | 11.53 | N.A. | N.A. |
| Avg Sales Exp ¢/$ of CC EAR | N.A. | 1.39 | N.A. | .30 | N.A. | N.A. | N.A. | N.A. | N.A. | .29 | N.A. | .26 | .30 | .28 | N.A. | N.A. |
| **POLICIES** | | | | | | | | | | | | | | | | |
| Survey Customers | No | Yes | No | Yes | No | No | Yes | Yes | Yes | No | Yes | Yes | Yes | Part. | No | Yes |
| Use Mailing List | No | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | Part. | Yes | Yes | Yes | Yes | Yes | Yes |
| Dem/Loaner Counter Equip. | No | Yes | Yes | Yes | Yes | Yes | No | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Dem/Loaner Heavy-Duty Equip | Yes | No | Yes | No | No | No | No | No | No | Yes | No | Yes | Part. | No | Yes | Yes |
| Service Equip | Yes | Yes | Yes | Yes | Yes | Yes | No | Part. | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Followup Dodge Rpts | N.A. | Yes | No | Yes | No | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | No | No | No |
| Kitchen Layout Serv | No | Yes | Yes | Yes | Part. | Yes | Yes | No | Yes | No | No | No | Yes | No | Yes | Yes |
| Incentives for Reps | No | No | Yes | Yes | No | No | No | No | No | Yes | No | No | No | No | Yes | No |
| Wiring Subsidy ($/Kw) | $5 | No | No | No | $5 | No | No | No | No | No | No | No | No | No | No | No |
| Finance Wiring | No | Yes | No | No | No | No | No | No | No | No | No | Yes | No | No | No | No |
| **PROGRAM** | | | | | | | | | | | | | | | | |
| Annual Rep Training | No | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Dealer Cooperation | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| See Cust Twice Yr | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| See Archts Quarterly | No | Yes | Yes | Yes | Yes | Yes | Yes | Part. | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |
| Direct Mail Quarterly | No | Yes | Yes | Yes | No | Yes | Yes | Yes | No | Part. | No | Yes | Yes | Yes | Yes | No |
| Free Trials— Counter Equip | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Free Trials— Heavy-Duty Equip | No | No | Yes | No | No | No | No | No | No | Part. | No | Yes | Part. | Yes | No | No |
| Prospect Meetings (min twice yr) | No | Yes | Yes | Yes | No | Yes | Yes | Part. | Yes | Part. | Yes | Yes | Yes | Yes | Yes | Yes |
| Spring/Fall Drives | No | Spr. | Spr. | Both | No | Fall | Both | Spr. | No | Spr. | Spr. & Sum. | Both | Spr. | Both | Spr. | No |
| Dealer Incentives | No | Yes | No | No | No | No | Yes | No | No | No | Yes | No | Yes | Yes | No | No |
| Mail "Food Service" to 30% of Cust | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Display Equip/ Model Kitchen | Yes | Yes | Yes | Yes | Yes | No | No | No | Yes | Yes | Yes | Yes | Yes | No | No | Yes |
| **RESULTS** | | | | | | | | | | | | | | | | |
| CC Kw Added—1956 | 4,416 | 3711.2 | 17,122 | 1,832 | 2,655 | 6,349 | 4,946 | 3,811 | 10,572 | 2,575 | 10,800 | 11,215 | 5,335 | 2,020 | 3,590 | 1,792 |
| CC Kw Added—1955 | 4,179 | 3,273 | 18,345 | 1,691 | 1,515 | 6,317 | 4,850 | 3,333 | 9,695 | 2,311 | 10,913 | 10,840 | 4,725 | 1,430 | 3,282 | 2,189 |
| 1955 CC EAR ($1,000) | 79.5 | 12.5 | 242.0 | 35.2 | 45.6 | 138.1 | 68.4 | 67.8 | 264.3 | 71.6 | N.A. | 260.0 | 168.5 | 42.4 | 82.6 | 44.5 |
| Est CC Kw Added— 1946–1956 | N.A. | 20,200 | 123327 | 13,208 | N.A. | 18,890 | 25,000 | 30,000 | 68,264 | 11,400 | 54,015 | 66,673 | 29,144 | 6,660 | 18,600 | N.A. |
| CC Kw Added per "Weighted" Cust | 2.89 | 2.88 | 2.82 | 2.72 | 2.53 | 2.44 | 2.42 | 2.41 | 2.40 | 2.29 | 2.20 | 2.04 | 1.97 | 1.97 | 1.96 | 1.88 |
| **LOAD ANALYSIS** | | | | | | | | | | | | | | | | |
| % from New Const | 49 | 20 | 20 | 37.6 | 30 | 57 | 40 | 40 | 35 | N.A. | 45 | 35 | 50 | 54.5 | N.A. | 20 |
| % from Remodeling | 14 | 10 | 15 | 28.2 | 50 | 13 | 40 | 25 | 30 | N.A. | 30 | 32 | 20 | 18.5 | N.A. | 15 |
| % from Replacement | 18 | None | 55 | None | 10 | 5 | 15 | 10 | 10 | N.A. | 5 | 18 | 10 | 16 | None | 50 |
| % from New Appl. | 19 | 70 | 10 | 34.2 | 10 | 25 | 5 | 25 | 25 | N.A. | 20 | 15 | 20 | 11 | N.A. | 15 |

| | Dal. P. &L. | Fla. Pwr. | Ken. Util. | Miss. P. &L. | S. Cal. Ed. | N. J. P. &L. | N.Y.S. E. &G. | Penn. Elec. | Wisc. Elec. | Hart. Elec. | Union Elec. | Jersey Cent. | Ind. P. &L. | Ark. P. &L. | West. Mass. | Duq. Light | S. W. G. &E. | L. A. W. &P. | Port. G.E. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7 | 11 | 21 | 5 | 26 | 26 | 29 | 22 | 27 | 30 | 30 | 3 | 9 | 4 | 6 | 18 | 4 | 27 | 20 |
| | None | None | None | None | None | None | 20 | None | None | None | None | None | 100 | None | None | None | None | None | None |
| | 18.3 | 32.4 | 23.95 | 21.5 | 146.9 | 10.1 | 41.7 | 41.8 | 54.2 | 13.95 | 49.4 | 27.3 | 25.5 | 28.0 | 14.7 | 55.0 | 24.4 | 124.9 | 24.0 |
| | 2.3 | 914 | 1.02 | 3.1 | 31.5 | 578 | 1.6 | 5.9 | Total | 189 | 3.6 | 1.03 | 1.1 | 2.5 | 1.5 | 4.06 | 4.6 | 8.9 | 3.0 |
| | 1.3 | 3.3 | N.A. | 800 | 10.03 | 520 | 2.0 | 3.0 | 4.5 | 1.0 | 4.3 | 2.1 | 1.8 | 3.8 | 1.1 | 4.7 | 2.1 | 5.0 | 1.2 |
| | 1 | 2 | 0 | 1 | 10 | 0 | 0 | 0 | 2 | 2 | 2 | 0 | 2 | 2 | 0 | 1 | 1 | 4 | 1 |
| | 6–20 | 14–20 | 16–30 | 15–20 | 96–3 | 5–30 | 21–5 | 18–25 | 31–2 | 1–10<br>1–80<br>6–20 | 33–10 | 2–50 | 0 | N.A. | 8–25 | 18–25 | 6–30 | 28–3 | 6–5 |
| | 1.60 | 1.73 | 2.69 | 3.66 | 1.16 | 2.38 | .42 | 1.42 | .62 | 4.95 | 1.30 | .48 | 1.09 | .72 | 1.79 | 1.14 | 1.35 | .74 | .89 |
| | N.A. | 31.8 | 26.0 | N.A. | 92.2 | N.A. | 15.0 | N.A. | 29.5 | None | N.A. | 10.0 | N.A. | N.A. | N.A. | N.A. | 39.8 | 44.0 | 10.0 |
| | N.A. | 11.46 | 14.58 | N.A. | 8.27 | N.A. | 6.07 | N.A. | 7.07 | N.A. | N.A. | 4.77 | N.A. | N.A. | N.A. | N.A. | 19.25 | 6.74 | 6.85 |
| | N.A. | .30 | .29 | N.A. | .15 | N.A. | .20 | N.A. | .31 | N.A. | N.A. | .16 | N.A. | N.A. | N.A. | N.A. | .52 | .30 | .33 |
| | Yes | Yes | No | Yes | No | Yes | N.A. | No | No | Yes | Yes | Yes | No | Yes | Yes | No | Yes | No | No |
| | Part. | No | No | Yes | No | Yes | N.A. | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No |
| | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | No |
| | No | No | Yes | Part. | No | No | Yes | No | Yes | Yes | Yes | No | No | Yes | No | No | Yes | Yes | No |
| | Part. | No | No | No | Yes | No | Yes | No | Yes | Part. | Part. | No | Yes | No | Yes | No | No | Yes | No |
| | Yes | No | No | Yes | No | No | No | Yes | Yes | No | Yes | No | Yes | Yes | Yes | Yes | No | Yes | No |
| | Part. | Yes | Yes | Part. | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | Part. | Yes | No | No | No |
| | No | No | No | No | No | No | No | No | No | Yes | No | No | No | No | No | Yes | No | No | No |
| | No | No | No | No | No | No | No | No | No | No | No | No | $5 | No | No | No | No | $4 | No |
| | No | No | No | No | No | No | No | No | Yes | No | No | No | No | No | No | No | No | No | No |
| | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | No | Yes | Yes | Yes | Yes | Yes | No |
| | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No |
| | Yes | Yes | Yes | Yes | No | Yes | No | Yes | No | Part. | Yes | No | Yes | Yes | Yes | Yes | Yes | No | No |
| | Yes | Yes | No | Yes | No | Yes | No | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | No | No |
| | Yes | No | Part. | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes |
| | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | No | No | Yes | Yes | Yes | Yes | Yes | Yes | No |
| | Part | No | No | Part. | No | No | No | No | Yes | Yes | No | No | No | Yes | No | No | Yes | No | No |
| | Yes | Yes | No | Yes | Yes | No | No | Yes | Yes | Yes | Yes | No | No | Yes | Yes | No | Yes | Yes | No |
| | Both | Spr. | Both | Yes | No | No | Fall | Both | No | Part. | Both | No | Fall | Spr. | Spr. | Spr. | Both | No | No |
| | No | No | No | $1 | No | No | Yes | Yes | Yes | No | No | No | No | No | Yes | Yes | Yes | No | No |
| | Yes | Yes | Part. | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| | No | Yes | No | Yes | No | No | No | No | No | No | Yes | No | Yes | No | No | No | No | Yes | No |
| | 2,437 | 4,883 | 3,060 | 1,850 | 18,612 | 1,043 | 4,075 | 5,100 | 6,735 | 1,618 | 5,725.33 | 2920.31 | 2,472 | 3,750 | 1,474 | 5,517 | 2,173 | 6,730 | 2,000 |
| | 2,452 | 4,100 | 2,537 | 1,600 | 16,920 | 1,199 | 6,300 | 4,400 | 6,060 | 1,834 | 5,648.03 | 26.04 | 1,666 | 2,606 | 1,421 | 5,415 | 1,069 | 6,027 | N.A. |
| | 40.4 | 104.7 | 89.3 | N.A. | 608.98 | 14.4 | 73.6 | 158.0 | 94.2 | 52.05 | 143.1 | 61.4 | 69.2 | 93.8 | 36.9 | 110.3 | 76.06 | 148.0 | 30.0 |
| | 10,500 | N.A. | 19,060 | 6,800 | 95,751 | 11,912 | 34,880 | 30,000 | 40,865 | 14,368 | 48646.33 | 9920.31 | 14,000 | 9,950 | 13,824 | 44,351 | 5,257 | N.A. | N.A. |
| | 1.78 | 1.76 | 1.72 | 1.69 | 1.67 | 1.66 | 1.65 | 1.61 | 1.61 | 1.60 | 1.40 | 1.39 | 1.35 | 1.35 | 1.32 | 1.26 | 1.05 | 1.03 | 1.03 |
| | 75 | 85 | 25 | 50 | 50 | N.A. | 60 | 45 | N.A. | N.A. | 55 | 35 | 50 | 15 | 40 | N.A. | N.A. | 60 | 60 |
| | 4.5 | 7 | 35 | 30 | 15 | N.A. | 30 | 45 | N.A. | N.A. | 25 | 45 | 20 | 15 | 20 | N.A. | N.A. | 25 | 20 |
| | .5 | N.A. | 5 | 8 | 20 | N.A. | N.A. | 5 | N.A. | N.A. | 15 | 5 | 25 | 70 | 15 | N.A. | None | 10 | 15 |
| | 20 | 8 | 35 | 12 | 15 | N.A. | 10 | 5 | N.A. | N.A. | 5 | 15 | 5 | N.A. | 25 | N.A. | N.A. | 5 | 5 |

# 3rd Commercial Cooking Survey

| ORGANIZATION | East. Shore | Cinn. G. &E. | Cons. Pwr. | Emp. Dist. | Texas Elec. | United Ill. | Ala. Pwr. | Iowa E.L.P. | Phil. Elec. | Det. Ed. | Cent. P. &L. | Col. & S. O. | Niag. Mhk. | Black Hills | Pac. P. &L. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Yrs CC Promoted | 8 | 7 | 3 | 6 | 5 | 12 | 5 | 5 | 26 | 10 | 3 | 3 | 3 | 20 | 30 |
| Merchandises CC (% territory) | None | None | 15 | 100 | None | None | None | 100 | None | None | None | None | None | None | None |
| Comm Meters (1,000) | 9.7 | 42.7 | 90.0 | 8.7 | 26.5 | 22.0 | 56.2 | 19.1 | 155.0 | 110.0 | 39.6 | 27.2 | 114.0 | 4.2 | 31.8 |
| Ind Meters (1,000) | 660 | 1.3 | 1.3 | 675 | 5.3 | 1.3 | 1.9 | 4.2 | 5.0 | 698 | 2.4 | 2.7 | 3.3 | 705 | 3.3 |
| Food Serv Cust (1,000) | 590 | 4.0 | 3.9 | 500 | 2.5 | 2.5 | 5.6 | 2.5 | 3.9 | 9.3 | 2.0 | 2.06 | 10.0 | 35 | 2.5 |
| Has CC Specialists | 1 | 1 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 2 | 1 | 1 | 1–50% | 1 | 0 |
| No. All-Purp. Reps. /% Time on CC | 2–15 | 15–3 | 7–40 | N.A. | 6–25 | 4–20 | 26–10 | 29–10 | 48–10 22–5 | 83–6 | 5–5 | 11–20 | 59–5 | 1–30 | 21–25 |
| Man-Yrs per "Weighted" F.S. Cust | 1.68 | .43 | .58 | 3.50 | 2.00 | 2.37 | .74 | 2.42 | .78 | .82 | .52 | 1.55 | .38 | 5.53 | 2.09 |
| **BUDGET** | | | | | | | | | | | | | | | |
| Sales Exp ($1,000) | 9.0 | N.A. | 27.0 | N.A. | N.A. | 30.0 | N.A. | 9.0 | N.A. | N.A. | 19.5 | N.A. | 26.0 | 10.0 | N.A. |
| Sales Exp/Cust—($) | 13.74 | N.A. | 4.14 | N.A. | N.A. | 14.84 | N.A. | 4.44 | N.A. | N.A. | 8.12 | N.A. | 2.88 | 4.26 | N.A. |
| Avg Sales Exp ¢/$ of CC EAR | .51 | N.A. | .21 | N.A. | N.A. | .73 | N.A. | .15 | N.A. | N.A. | .25 | N.A. | .23 | N.A. | N.A. |
| **POLICIES** | | | | | | | | | | | | | | | |
| Survey Customers | Yes | No | Yes | Yes | Yes | Yes | No | Yes | Yes | No | Yes | No | No | Yes | Yes |
| Use Mailing List | Yes | No | Yes | Yes | No | Yes | Part. | Yes | Yes | Yes | Yes | No | Yes | Yes | No |
| Dem/Loaner Counter Equip | No | No | Yes | Yes | Yes | No | No | No | No | Yes | Yes | Yes | No | No | No |
| Dem/Loaner Heavy-Duty Equip | No | No | No | Yes | No | No | No | Yes | No | Yes | No | Yes | No | No | Part. |
| Service Equip | No | Yes | Yes | Yes | No | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | Part. | No |
| Followup Dodge Rpts | No | Yes | Part. | No | No | Yes | Yes | No | Yes | Yes | Yes | Yes | Part. | No | No |
| Kitchen Layout Serv | Yes | Part. | Yes | Yes | No | Yes | No | Yes | No | No | No | No | No | Yes | No |
| Incentives for Reps | No | No | No | Yes | No | No | Yes | Yes | Yes | No | No | No | No | No | No |
| Wiring Subsidy ($/Kw) | No | No | No | | No | No | No | $6 | No | No | No | No | No | No | No |
| Finance Wiring | No | Yes | No | No | No | No | No | No | No | No | No | No | No | No | No |
| **PROGRAM** | | | | | | | | | | | | | | | |
| Annual Rep Training | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes | No | Yes | Yes |
| Dealer Cooperation | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Part. | Yes | Yes |
| See Cust Twice Yr | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Part. | No | Yes | No | Part. | Yes | Yes |
| See Archts Quarterly | No | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Part. | Yes | No |
| Direct Mail Quarterly | Yes | Yes | Yes | No | No | Yes | Yes | Part. | Yes | Yes | Yes | Yes | Part. | Yes | No |
| Free Trials— Counter Equip | Yes | No | Yes | Yes | Yes | No | No | No | No | Yes | Yes | Yes | Part. | No | No |
| Free Trials— Heavy-Duty Equip | No | No | Part. | Yes | No | No | No | No | No | Yes | No | Yes | Part. | No | Part. |
| Prospect Meetings (min twice yr) | Yes | No | Yes | Yes | No | No | Yes | No | No | Yes | Yes | Yes | Part. | Yes | No |
| Spring/Fall Drives | No | No | No | Yes | Spr. | No | Spr. | No | Spr. | Both | No | Spr | No | No | Sum. |
| Dealer Incentives | No | No | No | Yes | No | No | Yes | No | No | No | No | Yes | No | Yes | No. |
| Mail "Food Service" to 30% of Cust | Yes | No | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | Yes | Yes |
| Display Equip/ Model Kitchen | No | No | No | Yes | Yes | No | Yes | Part. | No | No | No | No | Part. | No | No |
| **RESULTS** | | | | | | | | | | | | | | | |
| CC Kw Added—1956 | 655 | 3431.1 | 6,156 | 533 | 2,170 | 1,832.2 | 4,294 | 1,692 | 8,462 | 6,247 | 1,565 | 1,180 | 4,850 | N.A. | N.A. |
| CC Kw Added—1955 | 800 | 3126.6 | 3,472 | 512 | 2,043 | 1,228.6 | 3,533 | 1,980 | 6,898 | 5,129 | 1,190 | 460 | 3.400 | N.A. | N.A. |
| 1955 CC EAR ($1,000) | 17.7 | 103.0 | 127.4 | 28.0 | 97.7 | 41.3 | 80.9 | 59.2 | 135.7 | 174.9 | 78.3 | 33.6 | 115.0 | N.A. | N.A. |
| Est CC Kw Added— 1946–1956 | 3,500 | 17,705 | 14,422 | N.A. | 10,000 | 19,232 | N.A. | 5,932 | 46,387 | 48,150 | 187,750 | N.A | N.A. | N.A. | N.A. |
| CC Kw Added per "Weighted" Cust | 1.00 | .97 | .94 | .93 | .92 | .91 | .89 | .83 | .74 | .73 | .65 | .57 | .54 | N.A. | N.A. |
| **LOAD ANALYSIS** | | | | | | | | | | | | | | | |
| % from New Const | 50 | 45 | 10 | 20 | 50 | 45 | 45.9 | 5 | 50 | N.A. | 40 | 50 | 50 | N.A. | N.A. |
| % from Remodeling | 30 | 30 | 25 | 20 | 30 | 35 | 54.1 | 5 | 30 | N.A. | 5 | 10 | 20 | N.A. | N.A. |
| % from Replacement | 10 | N.A. | 60 | 50 | 5 | 10 | None | 80 | None | N.A. | 5 | 30 | 20 | N.A. | N.A. |
| % from New Appl. | 10 | 20 | 5 | 10 | 15 | 10 | None | 10 | 20 | N.A. | 50 | 10 | 10 | N.A. | N.A. |

# Indianapolis P & L Installs Quiet-operating General Electric Boiler Feed Pump Motors

As part of a $130,000,000, eleven-year expansion program, the Indianapolis Power & Light Company recently installed a new 105,000 kw generating unit at their H.T. Pritchard Generating Station near Centerton, Indiana. The new unit—which includes three new 1250-hp General Electric Boiler Feed Pump Motors—has increased I.P. & L.'s total system capacity about 20%.

Commenting on the quiet operation of the new G-E Boiler Feed Pump Motor design, Mr. D.C. Hess, vice president of I.P. & L., remarked, "I feel that this is a progressive step toward better power plant equipment design. In an area of large rotating machines, these motors with the acoustical treatment will help keep the noise down to a comfortable level. In fact, I have to take a second look to see if the motors are running."

A new standard in quiet motor operation is made possible by a new baffling system in the intake-exhaust chamber, and improved Boiler Feed Pump Motor rotor characteristics. Other features—such as the new bearing system—reduce maintenance, increase reliability and lengthen the life of the G-E Boiler Feed Pump Motor. For more information on these important General Electric features, see the back of this page.

*Progress Is Our Most Important Product*

GENERAL ELECTRIC

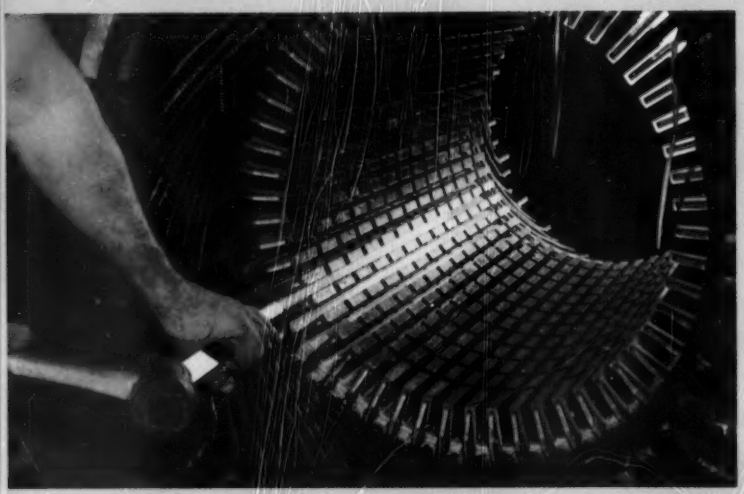
ELECTRIC DRIVES FOR THE ELECTRIC INDUSTRY

***Where electricity is generated, electric drives give top performance***

***. . . here's why***

ELECTRIC DRIVES FOR THE ELECTRIC INDUSTRY

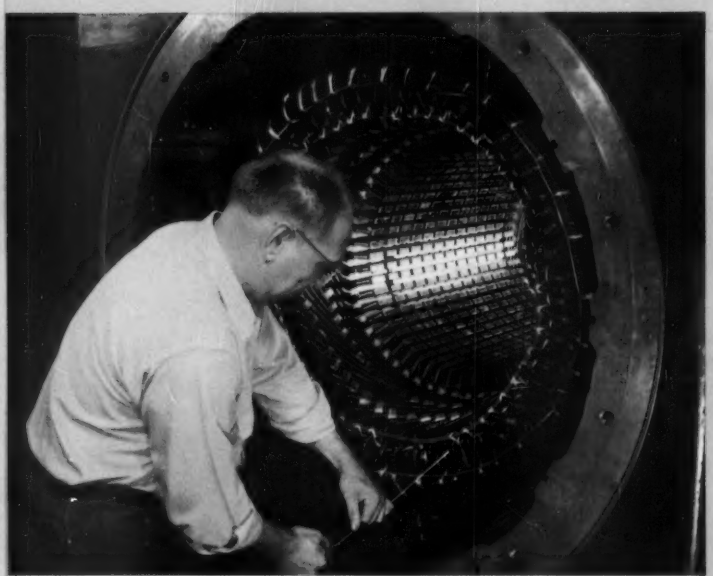
# New Stator Manufacturing Techniques, Materials Extend G-E Boiler Feed Pump Motor Life



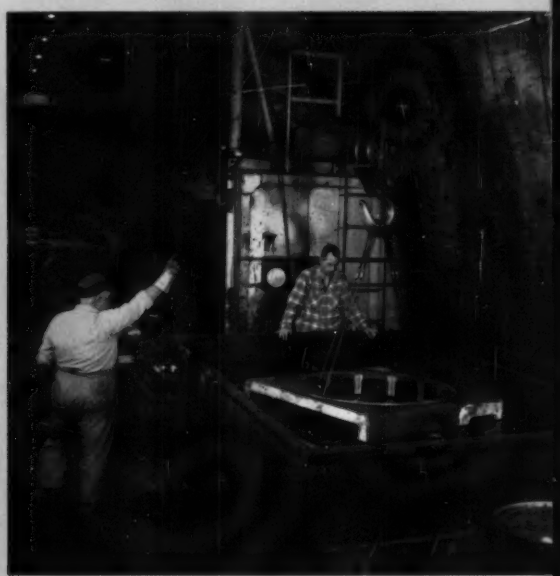
**NEW STATOR WEDGING METHODS** are designed to provide tight fitting coils in the General Electric stator. The non-hygroscopic trapezoidal wedges are first checked for accuracy and fit, and then driven into slots and cemented to fillers. This tight, stable fit has virtually eliminated the possibility of wedge and coil looseness.

New manufacturing techniques and materials have been developed and perfected by General Electric to extend the life of G-E stators. These techniques and materials are typical of developments throughout the design of the new Boiler Feed Pump Motor . . . developments that mean greater reliability, easier installation, and reduced maintenance costs on the motors you purchase.

FOR COMPLETE INFORMATION on this important General Electric motor advancement, contact your nearby G-E Apparatus Sales Office or write section 882-5, Medium AC Motor and Generator Department, General Electric Co., Schenectady 5, N.Y.



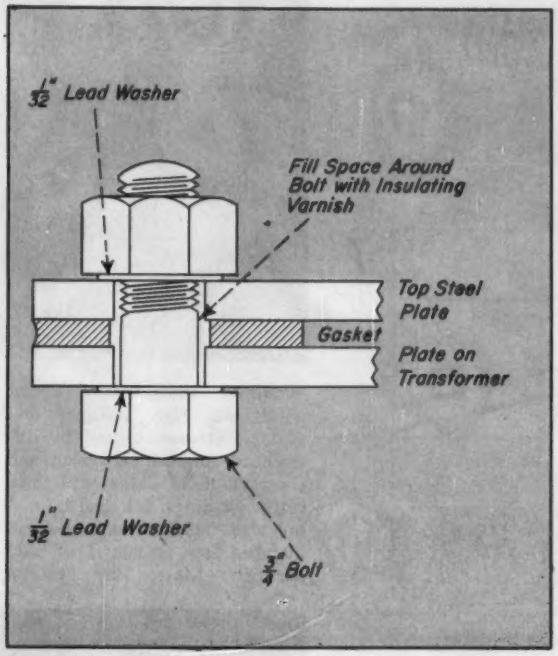
**IMPROVED COIL WINDING TECHNIQUES** are the result of thorough studies by G-E engineers. Coils are securely tied together and to insulated coil support rings by a patented technique using Permafil-treated glass roving. After baking, the roving becomes rigid and extremely tough, providing maximum winding support.



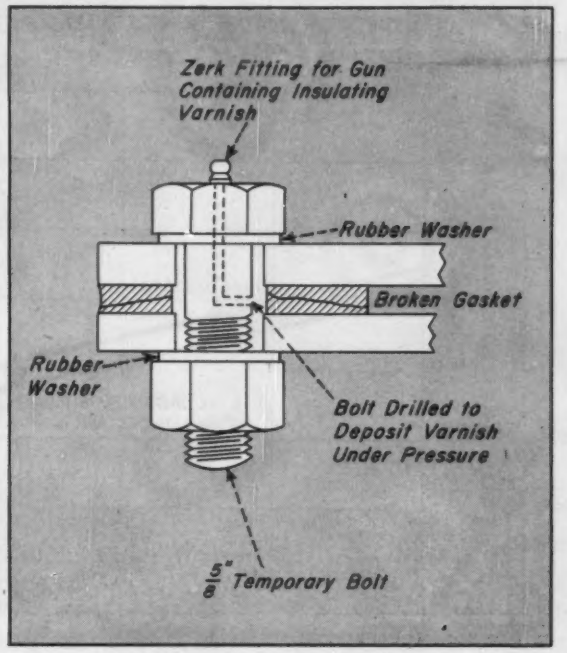
**DIPPING AND BAKING** of the completely wound stator seals the entire system against moisture and dirt and rigidly bonds the coil bracing. The entire frame is dipped in insulating varnish and baked to help provide more reliable G-E Boiler Feed Pump Motor stators.

*Progress Is Our Most Important Product*

GENERAL ELECTRIC




**BOLT LEAKS** can be stopped by two thin lead washers placed as shown. Once so placed, varnish is pumped around bolt




**BROKEN GASKET LEAKS** can be stopped by pumping varnish into the gasket with a pressure gun and a hollow bolt

**SUBSTATIONS**—Maintenance

# Stop Conservator Transformer Oil Leaks

**B. E. ELLSWORTH,** Chief Electrical Engineer, Platte Valley Public Power and Irrigation District, North Platte, Neb.

Most oil leaks on conservator type transformers occur around the bolts holding the top on the tank. These occur even when the gasket seems to be in good condition. Oil slowly seeps through the gasket and runs out around the bolts.

There are two ways of stopping such a leak. The simplest is to put a thin lead washer under the head of the bolt and another under the nuts as illustrated. Thick insulating varnish is then pumped around the bolt, usually ¾-in, which is tightened with at least a 15 in. wrench. This procedure stops most oil leaks around bolts.

In persistent cases, and where the gasket has a break in it, the varnish is pumped into the gasket under pressure, with a pressure gun and a hollow bolt. The hollow bolt is temporarily placed in the bolt hole through the cover plate.

Where temperature changes are extreme, a few bolts may have to be treated a second time. The thicker the varnish the better the seal.

**GENERATION**—Maintenance

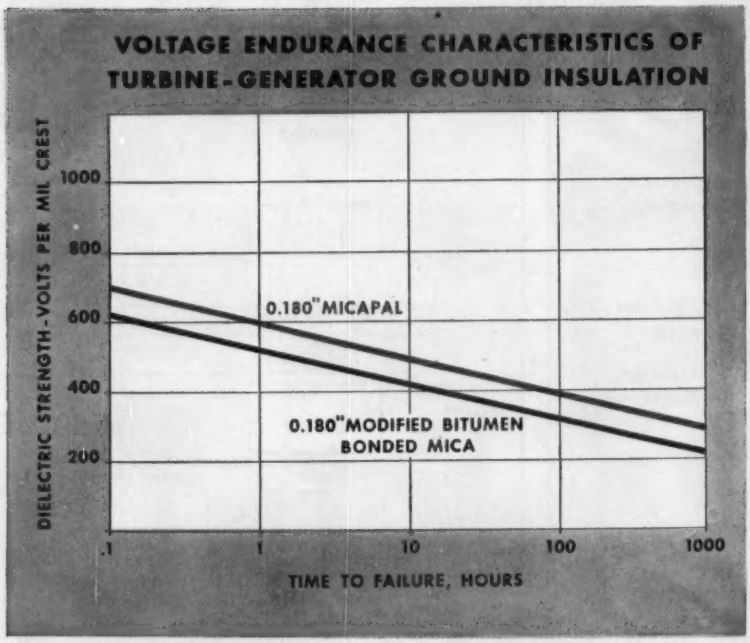
## Electrode Simplifies Welding Repairs

Use of a new electrode enables the welding department of Consolidated Edison Co of New York to reduce substantially the need for preheating and postheating many engineering alloys.

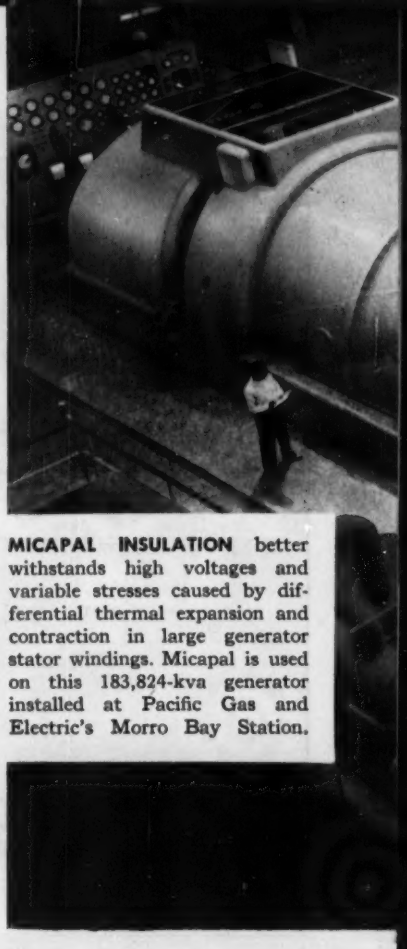
The electrode can be used in all positions and its spray-type arc facilitates deposition. Ease of slag removal compares favorably with that of other electrodes. It has simplified repair operations on such equipment as the large throttle valve in the illustration. This housing, made of carbon-moly steel, was removed from service because of a dozen or more cracks in the lower section. Some cracks were found to be 10 by 3 in. deep.

Using the electrode, the entire job was completed in a few hours with-

(*Continued on page* 94)

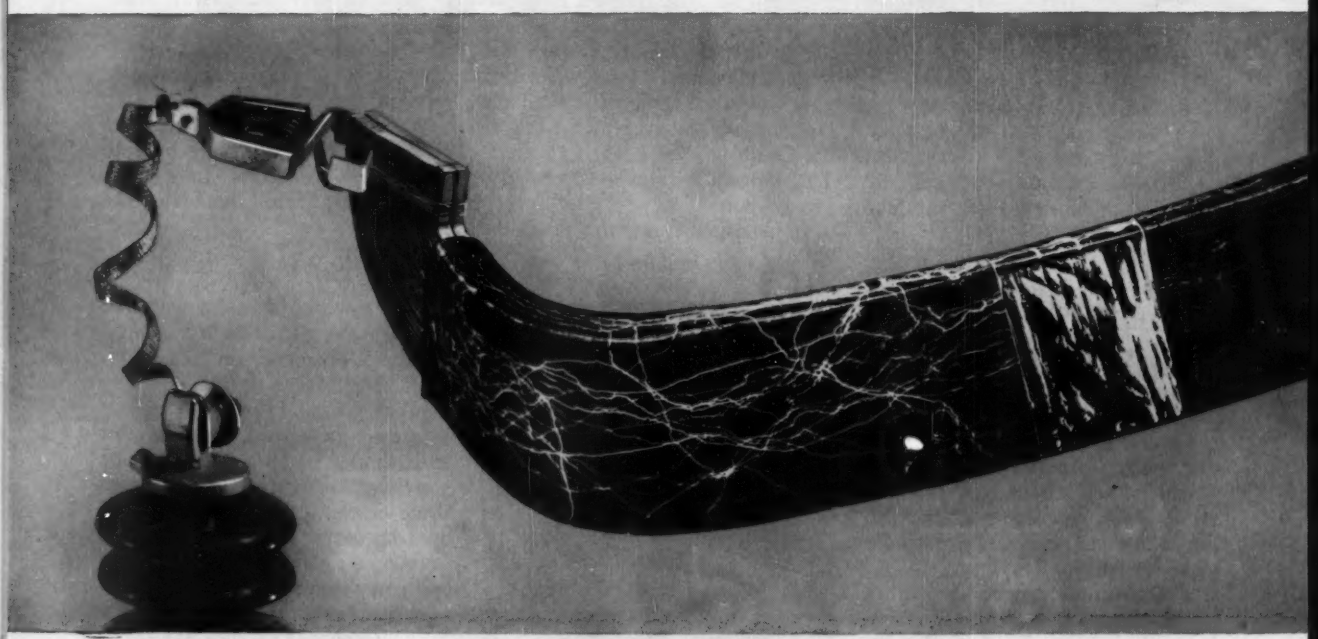



**SIGNIFICANT IMPROVEMENT** is noted in voltage endurance obtained for any duration of voltage application on Micapal compared to presently accepted generator insulating material. This improved voltage endurance increases long-term turbine-generator availability.



**MICAPAL INSULATION** better withstands high voltages and variable stresses caused by differential thermal expansion and contraction in large generator stator windings. Micapal is used on this 183,824-kva generator installed at Pacific Gas and Electric's Morro Bay Station.

# How General Electric Micapal



**INSULATION TESTS** such as pictured here are used to compare the dielectric breakdown of different insulations. Forced to carry voltages far above their rating, test bars of various types of insulation first develop corona streamers, then finally fail, enabling engineers to measure the insulation's actual voltage endurance.

# insulation extends generator life

## IMPROVED INSULATION BETTER WITHSTANDS HIGH VOLTAGES, VARIABLE STRESSES

Now, after extensive research and four years of operating experience, General Electric announces the extended application of Micapal insulation for high-voltage stator windings. A major advance in providing still longer, more reliable operation, this mica-based insulation offers these distinct advantages:

**Greater Tensile Strength.** Micapal incorporates mica mat and some mica flake bonded with a duplex thermosetting resin. Mica mat is finely divided, reconstituted mica formed into sheets. The thermosetting binder, combined with uniform mica structure, makes Micapal much tougher at operating temperatures than earlier insulations.

**Greater Dimensional Stability.** Micapal is molded to the precise shape of generator armature bars. Because of thermosetting qualities, the insulation won't flow or lose shape. It possesses great mechanical strength over the full range of operating temperatures.

**Improved Thermal Conductivity.** Micapal removes heat from electrical conductors more easily. The result is that for a given current and same insulation thickness, the armature bar runs cooler.

**Improved Dielectric Breakdown Strength.** The voltage endurance characteristics shown on the chart, above, illustrate how Micapal insulation withstands a much higher voltage than other mica insulation for any given period of time. The impulse puncture structure of Micapal has been shown by laboratory tests to be higher by an even greater factor.

Improved Micapal insulation is just another example of General Electric steam turbine-generator progress in meeting tomorrow's power demands. For more information on new generator developments, write Large Steam Turbine-Generator Department, General Electric Company, Schenectady 5, New York.

254-41

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## Simplifies Welding

(*Continued from page* 91)

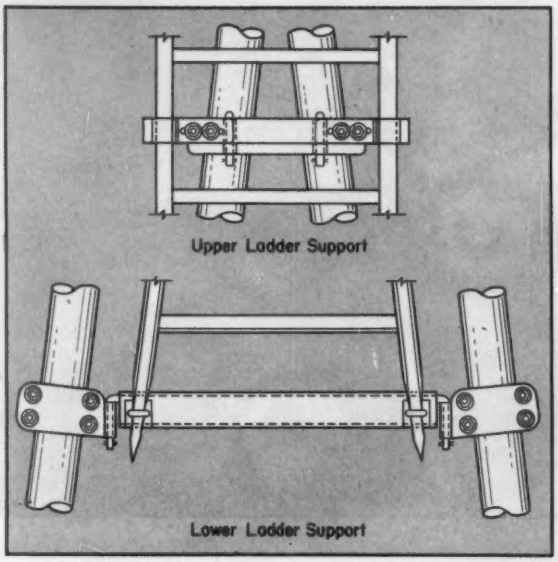
out any preheating or stress relieving. Three men worked simultaneously inside the valve, the entire operation resembling an assembly line.

The welds were made in almost every position, the electrodes having been cut down to fit in the close quarters.

This valve has been back in service more than six months. Had the repair work been impossible to complete, the company might have faced a year's delay before delivery of a new unit.

Strong, ductile, and corrosion-resistant welds can be made in almost any ferrous alloy, including carbon and highly alloyed steels. Tests indicate that x-ray quality joints can be made with one electrode in about 90% of the dissimilar metal applications in the average fabricating plant.

**DISTRIBUTION**—Construction



**SPECIAL BRACKETS secure an extension ladder to a line truck boom so that mid-span work can be done from the ladder**

# Mount Ladder on Hydraulic Truck Derrick

**W. R. BICKEL,** Superintendent, Distribution Overhead Construction, Union Electric Co, St. Louis, Mo.

Brackets for mounting a ladder on a hydraulic truck derrick have been developed by assistant engineer F. W. Pecka of our distribution overhead construction department.

The idea came from makeshift arrangements used by several line crew foremen. These makeshifts usually consisted of extension ladders securely strapped or guyed to the derrick or boom of a line truck. They were used mainly when working on lines at mid-span or in place of the "Sky Worker."

The new brackets have two main assemblies, upper and lower ladder bracket supports. These bracket supports fasten the extension ladder securely to a line truck boom and are easily removed from the boom by releasing cotter keys. They do not interfere with normal operation of the boom.

Set-up or break-down time, once the assemblies are adjusted for a particular extension ladder, is less than 10 min. Heights of the ladder can be adjusted after it is in place on the brackets. A height of 38 ft can be reached when a 30-ft extension is used.

Standard stock items were used in fabrication of the brackets. Cost of material was approximately $12. Cost of labor was about $50. Total weight is less than 30 lb.

## Australia Is Planning Three Power Stations

Melbourne (McGraw-Hill World News)—The New South Wales State Government, Australia, has announced plans to construct two 800-Mw power stations at a cost of about $275 million.

Present plans provide for the two stations to be operating in about 10 years. They will be located on coal fields and each will use more than one million long tons of coal annually. Sites have not yet been announced.

At the present rate of increase in its power demand, the New South Wales State has to double its generating capacity every eight years. Three large power stations are being built but will not be in full-capacity operation for about three years.

These stations are: Tallawarra (320 Mw), Wangi (330 Mw), and Wallerawang (240 Mw).

# New Portable Instrument by General Electric Gives High Accuracy Readings You Can Trust

**PACIFIC GAS AND ELECTRIC COMPANY** lineman uses the AP-12 to check voltage on secondary side of regulators. Highly accurate, rugged AP-12 is ideal for use in the field.

*Reg. trade-mark of General Electric Co.

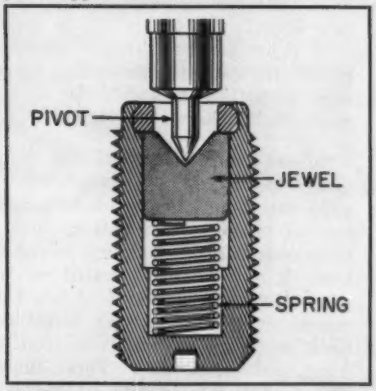
More and more power companies are finding that General Electric portable instruments give highly accurate readings you can rely on. This is especially true with the AP-12, newest addition to the complete line of G-E portables. High accuracy (¼ of 1% at full scale) and rugged, shock-resistant construction make the AP-12 ideally suited for a wide variety of measuring jobs.

**COMBINING EXTREME VERSATILITY** with high reliability, the AP-12 is equally at home in the lab, shop, or field. Power companies find it the ideal testing instrument, because its high accuracy—even under adverse field conditions—gives you readings you can trust . . . enables you to realize savings in both time and money.

**FOR PRECISE A/C AND D/C MEASUREMENTS,** choose the AP-12. Its long, more uniform scale is easier to read. Universal terminals and rugged Textolite* case make it more convenient to use in the field. New spring-mounted jewel bearings offer greater protection . . . prevent pivot blunting. And, it's shielded against magnetic effects.

**FOR ALL YOUR MEASUREMENT REQUIREMENTS,** look to General Electric. We offer you a complete line of portables . . . instruments for measuring a/c, d/c, or both . . . with full-scale accuracies from ¾ of 1% to ¼ of 1% . . . whatever is needed for your particular job.

**FOR MORE INFORMATION** about General Electric portable instruments, contact your nearby G-E Apparatus Sales Office, or write to General Electric Company, Section 582-26, Schenectady 5, N. Y. for your copy of Bulletin GEC-1384.




**UNIQUE PIVOT-AND-BEARING DESIGN** gives longer life to G-E portable instruments. Spring-mounted jewels cushion pressure on pivot points . . . protect against shock and damaged jewel assemblies . . . substantially reduce what is a major maintenance problem in most portables.

GENERAL ELECTRIC

# Field Recording of Conduit and Manholes

## Instructions outlined for field-book method to record underground construction and installation data, adapted from Detroit Edison Co manual

Complete records must be made of all underground construction. These records describe installations as actually constructed, and become part of the permanent company records.

The standard field book shall be used for records of all conduit, manholes, and buried cable installed by the Underground Lines Department.

Records must be kept up to date. They shall be made daily for all completed work, or work far enough along so that complete notes can be made. Records should be made before work is covered up.

Field books and related records shall be turned in to the department office as soon as the job is completed.

Drawings and lettering on all pages of the field book shall read either from the bottom or right hand edge of the page.

Pages shall be numbered in the upper outside corner.

### Field Book Record for Conduits and Manholes

First page for each job shall be on a right hand page of the book. It shall show the following information.

**First Page.** Give description of work covered, and showing: Location; Department order number; Work order number; Date work started; Date work was finished; Who did the work (company labor, or contractor's name); Foreman; Fieldman (or record keeper); Inspector's name and who he represents (Municipal Department, Road Commission, etc.); Permit numbers and who issued them; Layout drawing number; Description of bench mark used.

Each conduit run (manhole to manhole) shall be recorded as a unit according to the following schedule until the entire job described on the first page is covered.

If the job starts from an existing manhole and involves only a new shelf, show that manhole on the right hand page following the first page, leaving back of first page blank. Record all changes made in connection with the new work.

If there are no changes in existing construction to record, the second page will be the plan view of the first conduit run. This should be drawn on the left hand page which is the back of the first page.

**Second Page.** Carry plan of conduit run, showing North arrow (north or east toward top of page), and these additional items: Center line of conduit; Shapes and numbers of manholes; Laterals to cable poles, buildings, or blind ends (identify buildings served by conduit); Property lines (if not definitely located on layout drawing, show where they were assumed to be); Curb lines (show curb returns as arcs of circles); Street names, alley designations, etc; Surface conditions (concrete or asphalt pavement, sod, mud, etc). Show dimensions (in feet and inches) between centers of manhole covers, between centers of manhole covers and property lines, curb lines to property lines, curb lines to curb lines, width of walks, edges of walk to curb line and property line. Also show sections of main conduit and laterals, looking either north or west along the conduit, and arrows connecting section sketch to point where it is taken. Show length of all conduit runs: Main conduit—length from duct face to duct face in manholes; Laterals—length from duct face in manhole to duct face in building or top of sweep at cable pole. Show complete duct lengths on the arrow lines connecting section sketches to point of section. When old conduit is extended, duct length shown shall be the complete duct length.

**Third Page.** Record elevation of conduit run whose plan is shown on preceding page. (This sketch will be on the page facing the page on which the plan is drawn.) Show the following: Outline of conduit and manholes projected directly opposite the plan; Elevation looking either north or west, and note direction; Elevation of manhole covers; Elevation of bottom of new manholes. If grade is uniform from one end to the other, show elevation of bottom of conduit at each end, and give percent of grade. If grade is not uniform, show elevation and station at each break in grade and percent of grade between breaks. Also show: Station and elevation where a lateral leaves the main conduit; Surface elevation at cable pole sweeps; Identity of all obstructions (water pipes, gas pipes, sewers, etc) passed over or under and exposed in the excavation. Small service pipes need not be shown unless they cause a change in grade. Give elevation and station of each of above obstructions. Note ground conditions and type of bracing used.

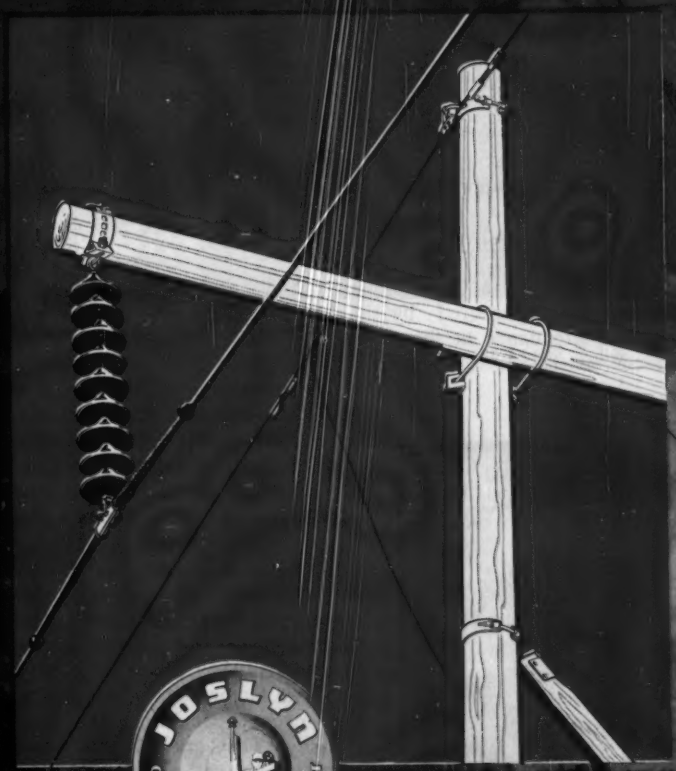
**Fourth Page.** Record manhole plan and details, showing manhole number, and indicate: Head room (vertical distance between roof and floor); Chimney height (bottom of roof to top of cover); Volume (calculate from length, width, and head room, with no allowance for corners cut off); Type of manhole construction (brick or precast concrete); Type of roof construction (precast concrete, poured in place concrete, or brick); Date of construction. Draw plan of manhole (inside); showing length and width, depth of shelves, and dimensions from center of cover to walls or duct face, and show North arrow. (Draw plan with north or east at top of page.) Also show obstructions near manhole walls; Sections of all conduit entering manhole (at bottom of page); Show distance from top of top duct to level of cover for each conduit section.

**Fifth Page.** Draw plan and elevations of manhole drains, showing North arrow. (Draw plan with north or east at top of page—draw elevation looking north or west.) Include following: Dimensions to manhole walls from center of drain outlet in floor; Size and type of drains; Length of drains from manhole outlet to discharge; Elevation of drain at flow line at outlet and discharge, and at any break in grade; Grade of drain in percent for each length of different grade.

Note: If only a sump is installed, do not use a separate page for drain. Instead, note on manhole plan page under date of construction "2′ of 12″ crock sump."

**Sixth Page.** Sketch plan of next conduit run. Following pages to show information for next conduit run as listed above. Continue for each conduit run until entire job is recorded.

# COMPLETELY BANDED TRANSMISSION STRUCTURES



Use of Joslyn Banded-Type Transmission Hardware results in—

1. Greater strength by eliminating pole gains and bolt holes.
2. More uniform surface distribution of leakage current.
3. Reduced probability of damage from lightning flashovers.
4. Easier assembly because of interchangeable fittings and elimination of pole framing.
5. Greater flexibility of structure design because of fewer standard parts.
6. Simplified purchasing and material handling because of unframed poles and spars.

*Photograph is of line in service for over 10 years.*

JOSLYN

MFG. AND SUPPLY CO., 155 North Wacker Drive, Chicago 6, Illinois

# 'Fiestas' Sell Commercial Cooking for WP&L

**R. C. PFLUG,** Sales Engineering Manager, Wisconsin Power & Light Co, Madison, Wis.

**CUSTOMERS unable to get to large commercial cooking trade shows flock to WP&L's 'Fiestas', which provides cheap mass-selling means of reaching them**

Commercial Cooking "Fiestas" have upped the sales of equipment in Wisconsin Power & Light Co's service area, and at the same time have reduced the strain on manpower for its promotion. Fiestas have brought the mass-selling technique to this field.

There are 1,200 food service operators customers in our area, most of which have the owner as an integral part of the organization. This usually prevents him from getting far from his business. He can't attend the big shows at Chicago and Milwaukee because he can't stay away that long. Restaurant supply salesmen call on him infrequently because his orders are small.

### Take Shows to Customers

So WP&L took the shows to the customers. The first fiesta was held at Lake Delton, Wis., in April, 1954. It was a combined effort of equipment manufacturers and dealers, food suppliers and WP&L. We felt that if the demonstration attracted 50 people, it was worthwhile. It drew 190.

The customers came, watched demonstrations, sampled products and had a good time. Actual equipment sales were:

- 2 automatic coffee makers
- 2 reach-in refrigerators
- 1 large electric grill
- 3 frying machines
- 5 ice cube makers

The show was considered a big success. Attendance was four times what we'd hoped for; prospect lists were developed; we got on friendlier terms with our food service customers; and suppliers found a new market. The fiesta show also helped us develop dealer goodwill and settle service problems.

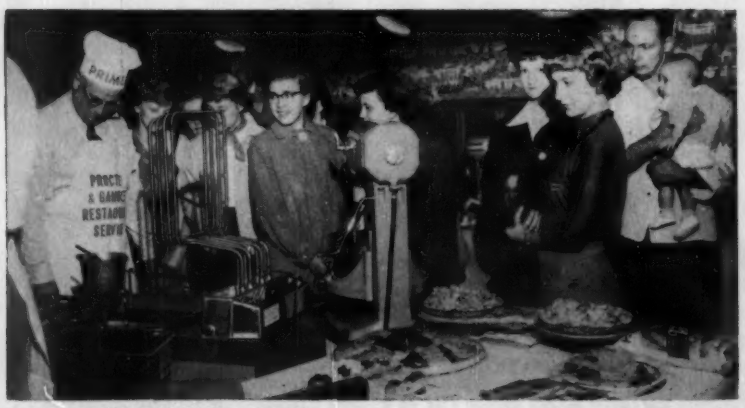
Since the first fiesta, a total of seven have been sponsored by WP&L. Total attendance at these shows stands at 1,333. This indicates the customers like them, come back each year, and bring their friends.

We've found that a Commercial Cooking Fiesta, to be successful, must:

- Be well advertised.
- Have an informal atmosphere.
- Be cooperative with food and equipment suppliers.
- Have expert demonstrators.
- Be limited in size and number of demonstrators.
- Be shown at well known places.
- Stress "Have fun on your day off" theme.
- Be repeated year after year.

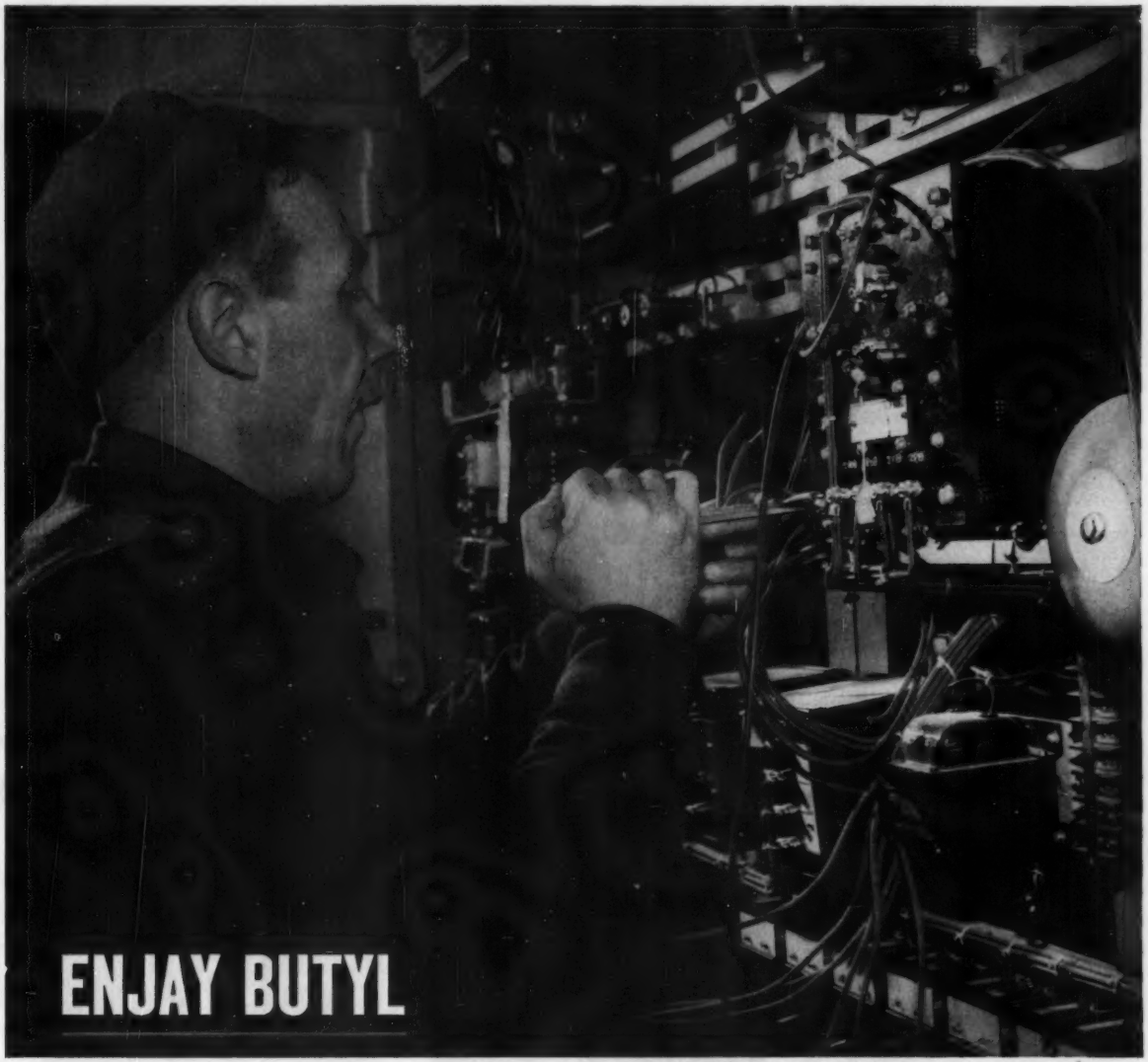
One advantage of the Fiesta is that it allows us to reach our customers who are spread over a wide area relatively cheaply. Costs are reasonable. Average cost per customers is 35¢. This is much less than the cost of individual calls.

Loads, too, reflect the fiesta's success. Commerical cooking kw has jumped from 1,450 in 1952 to more than 3,000 for the first nine months of 1956. These loads have high load factor, high power factor, high revenue per kwhr, and good diversity. They are added in small amounts, and as the fiestas have shown, are adaptable for use with mass selling techniques.



**FOOD AND EQUIPMENT SUPPLIERS are necessary ingredients in recipe for successful commercial cooking fiesta, as is friendly informal atmosphere**

(*More Selling on page* 102)




# *electrical wonder rubber* OFFERS TRIPLE VALUE

**Performance! Versatility! Economy! In all three, Enjay Butyl is the world's outstanding rubber value. In a wide variety of applications, Enjay Butyl rubber stands *unmatched* in its ability to resist ozone and corona, impact and abrasion, moisture and weathering . . . properties that contribute to the *outstanding* performance of Butyl-made products.**

**Instrument transformers, underground service cables, high voltage industrial cables . . . in these, and many other electrical applications, Enjay Butyl out-performs and out-lasts *all other* types of rubber, synthetic *or* natural. *Low-in-cost* and *immediately available*, this truly wonder rubber may well be able to cut costs and improve performance in *your* products. For further information, and for expert technical assistance, contact the Enjay Company.**

ENJAY

*Pioneer in Petrochemicals*

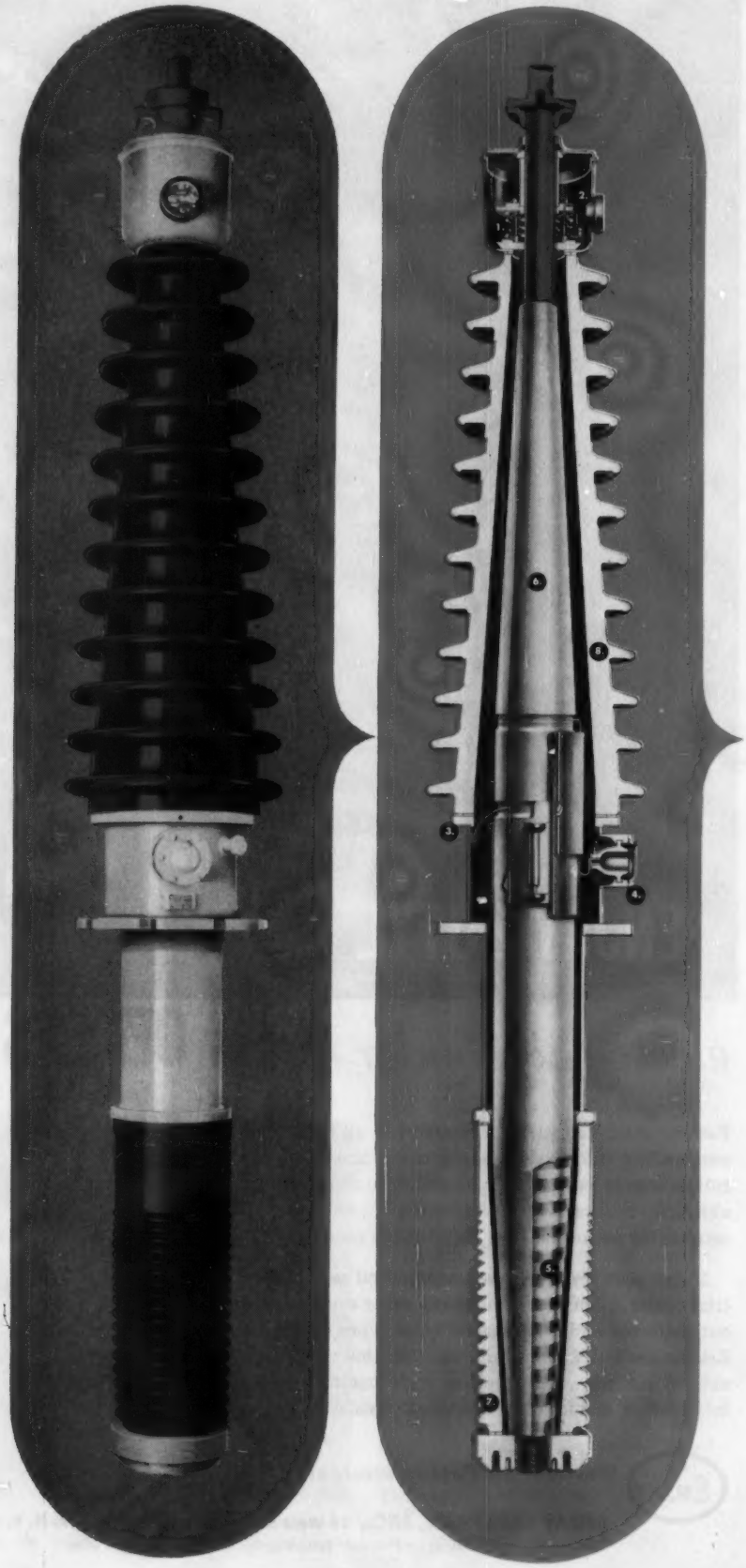
**ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.**

*Akron • Boston • Chicago • Detroit • Los Angeles • New Orleans • Tulsa*

ENJAY BUTYL

**Enjay Butyl is the greatest rubber value in the world . . . the super-durable rubber with *outstanding* resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.**

**the inside story behind...**



# 252,921 years of CORONA-FREE dependability...

THESE CONSTRUCTION DETAILS MEAN BETTER PERFORMANCE

1. Compression spring assembly
2. Inert gas space
3. Concentric gasket assembly
4. Potential tap receptacle
5. Concentric foil layers
6. Oil-impregnated condenser
7. Lower porcelain
8. Porcelain weather casing

## Westinghouse type "O" Condenser Bushings for 92-345 kv

With over a quarter-million service years behind 43,553 Westinghouse Type "O" condenser bushings, there have been only two instances of electrical difficulty. You get extra dependability—under all conditions—from Type "O" bushings. Here's why . . .

**Freedom from corona** is maintained through uniform voltage distribution.—Free from voids.

**Greatest mechanical strength** is provided by an exclusive Westinghouse one-piece casing of wet-process porcelain, loaded in compression only. Condenser "floats" within casing, eliminating mechanical stress.

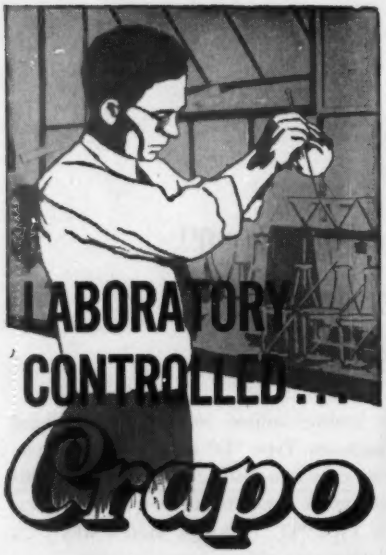
**Highest electrical strength** is obtained from continuously wound, oil-impregnated kraft paper and concentric foil layers. Insulation remains free from mechanical loading. These bushings have greater dielectric strength than any other bushings made . . . supplemented by a superior design potential tap. Insulation has not been reduced at the expense of reliability.

**Highest thermal stability** provides longer service life. The lowest power factor of any known bushing test limits 0.6% at 25° C, 1.0% at 85° C. Copper is worked at low current density to prevent internal heating . . . free from hot spots.

For complete information about Type "O" bushings, call your Westinghouse representative . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70825

YOU CAN BE SURE...IF IT'S

Westinghouse




**GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE**

The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

**Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.**

*Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."*

INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana



# Standards for Electric Heat Equipment?

## Yes, says contractor magazine editor. He suggests NEMA standardize equipment to protect industry from bad jobs

Lack of NEMA standards in residential electrical space heating equipment, with the resultant influx of dubious products and their use by contractors, spell possible disaster to this industry, according to H. L. Mann, an editor of Contractor's Electrical Equipment, a monthly magazine for electrical contractors.

Standardization has been undertaken in many other parts of the electrical industry and should be started immediately in electrical home heating, he advises.

### Leads to Better Products

Establishment of NEMA standards for capacity, performance, comfort and safety, Mann professes, would lead to better products. These standards would benefit the contractor and the customer because:

- Contractors could be sure of the quality of the heating unit they were installing. They would know that the product complying with NEMA standards will help them build their reputation for quality work.
- Customers would receive a guaranteed performance of comfort, safety, and reliability. Total cost would be lessened; as with the better products, service and maintenance costs would go down.

Some present difficulties in the field are caused by the "wattage race," similar to the horsepower race in the automotive industry, says Mann. Here unnecessary power is used as a qualification of the product ability. Excessive wattage, which on some units runs as high as 375-w per ft length of baseboard, not only lowers comfort and heating efficiency, but also can create hazardous conditions. Desirable maximum wattage density to which the industry would probably agree to is around 275 w/ft.

Surface temperatures of the leaders of the wattage race can run as high as 300F. This is obviously unsafe near playing children. (Standards should perhaps include safety devices to prevent children from sticking their hands inside a baseboard heating unit).

Troubles in installation of the baseboard heating units are mainly caused by this wattage race. Mann pegged these as:

- Rating of watts per linear foot presently based on the length of the metal housing does not give an accurate picture of a unit's capacity. Rating should be based on length of the heating element instead.
- High wattage density does not provide comfort heating of efficiency. For optimum comfort and efficiency, capacity or equipment should be spread over a wide area. This can be achieved with a relatively low wattage density.
- Discoloration of walls and drapes as well as hazardous high surface temperatures are caused by the high-wattage density of base board convectors.

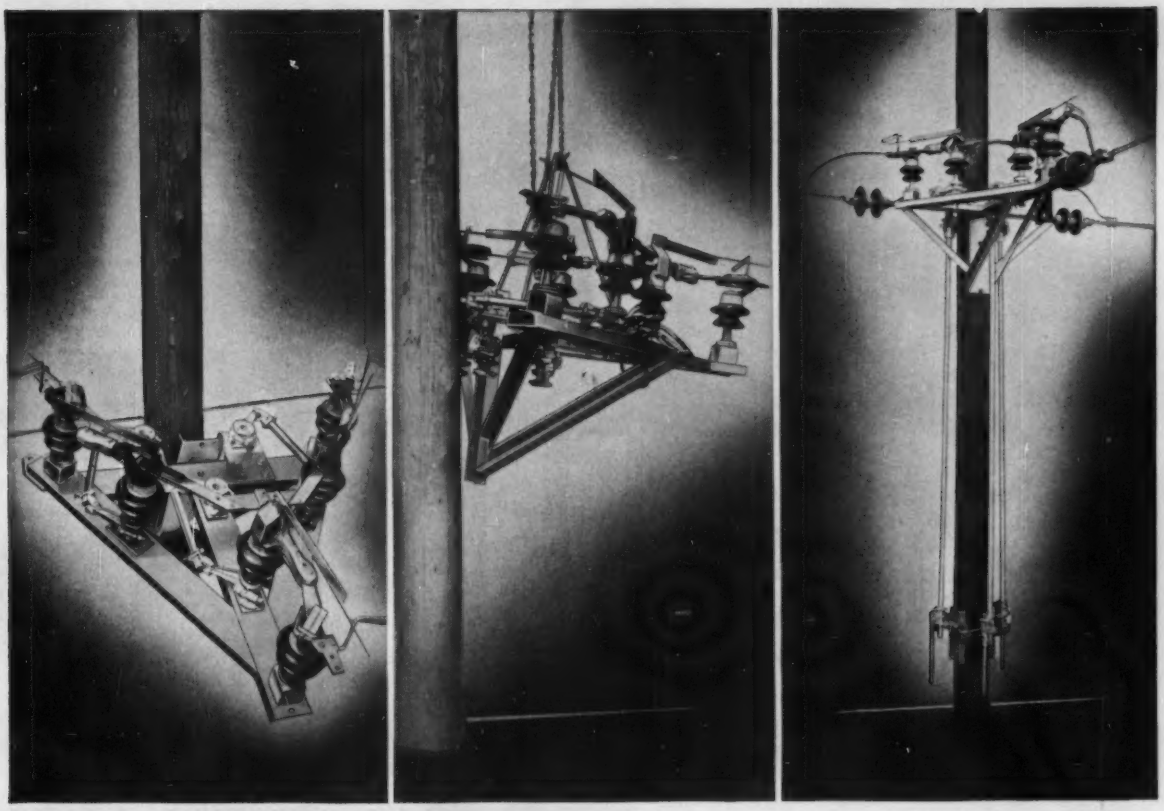
### Defunct Makes Are Headaches

Another trouble Mann points out, is warehouse stocking of units manufactured by companies now defunct. Contractors and customers buy them, usually at a low price. But when parts replacements became necessary, it's as hard as waking the dead. This in turn, leads to inadequate service and a dissatisfied customer.

Contractor opportunities, according to Mann, in the electrical heating field are "golden". Every happy customer broadcasts tidings of comfort and pleasure to all, but the displeased one will create more than his share of static.

Mann believes NEMA should establish the standards because so many leading manufacturers of electric heating equipment are members of its Electric House Heating Equipment Section.

(*More Selling on Page* 106)



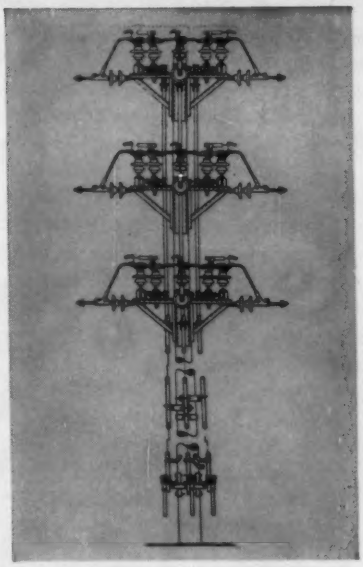
# Expansion problems solved quickly with DELTA-STAR Type TH Pole Top Switches

Does time sometimes run short on your expansion projects? Is ground space sometimes at a premium? If you have these or similar problems, you may readily solve them with the installation of Delta-Star Type TH Pole Top Switches.

Installation of Type TH Switches is quick and easy because the switches, bases and frames are mounted as an integral unit. There are no separate units to install. Each switch has a simplified, independent operating mechanism, permitting 3-phase operation from ground level.

Quick-whip arc suppressors eliminate heavy arcing during interruption of line and transformer charging current up to 15 amperes. Standard open gap spacings meet or exceed AIEE and NEMA guarantees.

Type TH Switches can be installed at less than ¾ the cost of conventionally-mounted air switches. It will pay you to check into them soon. Call your nearby Delta-Star representative.



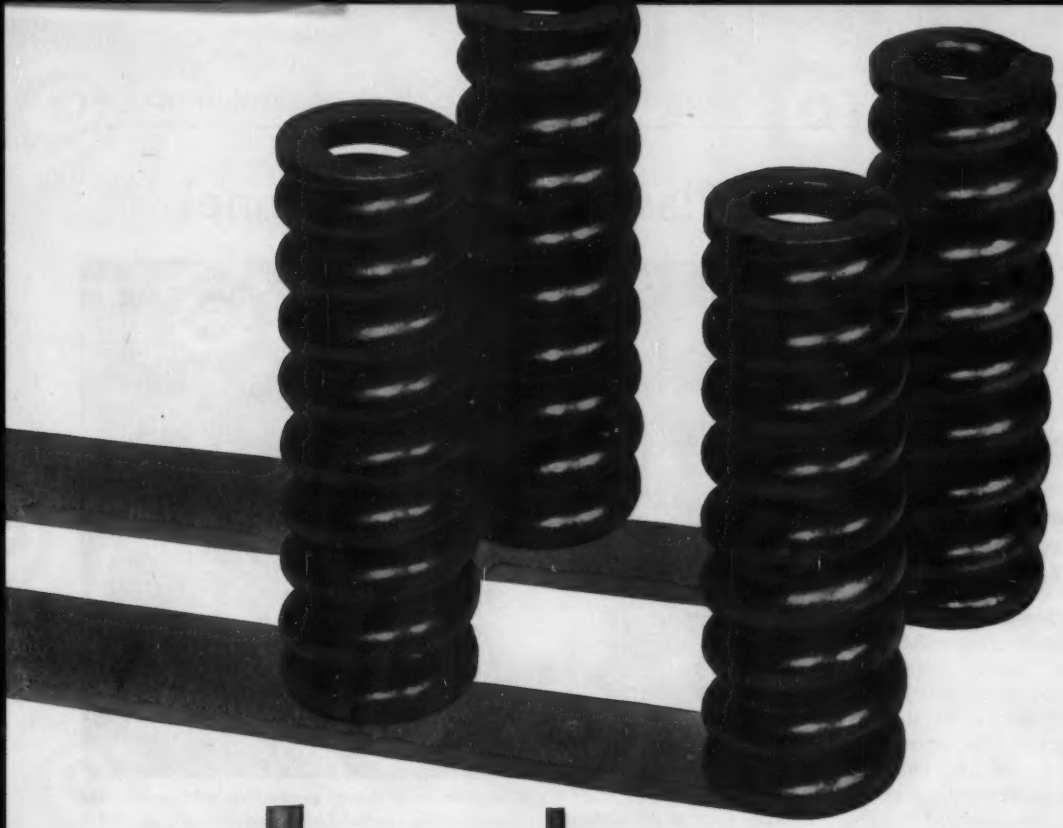
**Type TH Pole Top Switches may be obtained for 2-way or 3-way switching, in 400 and 600 ampere ratings, and 7.2 to 69 kv. For complete data, write for Bulletin T-5511.**

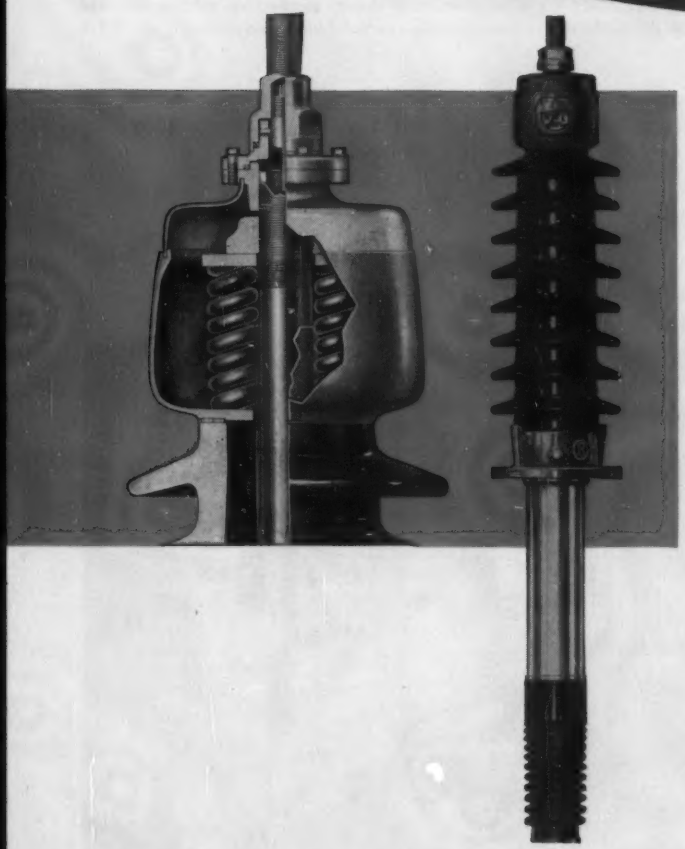
## H. K. PORTER COMPANY, INC.

### DELTA-STAR ELECTRIC DIVISION

Divisions of H. K. Porter Company, Inc.: Cleveland, Connors Steel, Delta-Star Electric, Henry Disston, Leschen Wire Rope, Quaker Rubber, Refractories, Riverside-Alloy Metal, Vulcan Crucible Steel, W-S Fittings, H. K. Porter Company (Canada) Ltd.

# WHY O-B BUSHINGS STAY TIGHT!





There was room for improvement in bushing assembly—improvement on the spring compression principal O-B originally developed. Springs must be steel. This meant danger of magnetic heating in the strong field of a bushing conductor if a single spring surrounded that conductor, as was often the case.

Now, in the new O-B condenser bushing, a nest of springs do the work. All are external to the conductor. There's more safety in numbers, and heating is negligible.

To be sure the springs "stay out of the act" in carrying current, the lower portion of the reservoir where the springs seat is insulated from the central conductor. Thus, another possible cause of trouble has been eliminated.

Such design refinements are typical of the new O-B condenser bushing line. After making bushings for 50 years, we knew where sound refinements were needed.

When you specify O-B bushings for your new apparatus you will be getting the cleanest piece of modern design on the market today. It will pay off in better service.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

4792-H

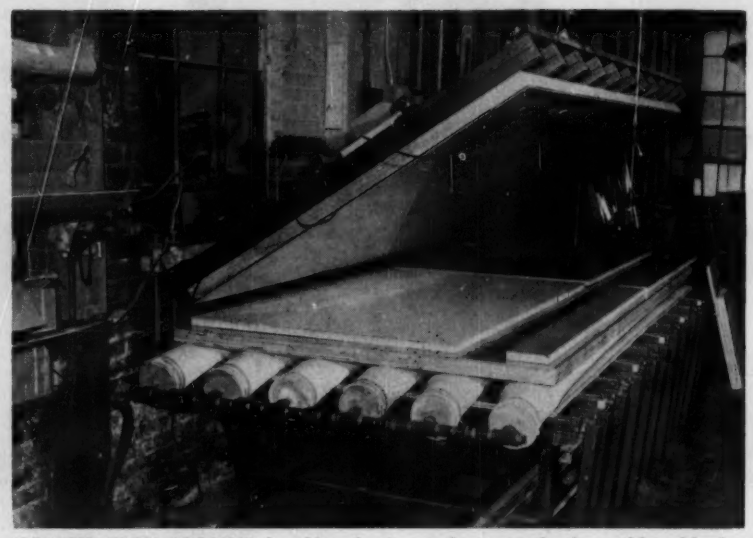
# Novel Oven Bonds Plastic To Wood Panel

**GEORGE C. WAGNER,** Industrial Engineer, Union Electric Co, St Louis, Mo.

A unique application of electric heat is used at the Logan Manufacturing Co, St Louis, Mo., to help dry the adhesive that bonds a plastic coating on wooden panels. Heat to dry the adhesive is supplied by a conductive rubber heating blanket which measures 54 by 126 inches.

The top platen of the bonding press is 58 by 130 inches. A one-eighth-inch aluminum sheet with the same dimensions as the top platen completely covers the conductive rubber blanket, isolating it from the wooden panels underneath.

The rubber blanket is thermostatically controlled to operate at 150 F. Temperature variation throughout the heated portion of the pad is held to less than ±5 F. The front edge of the platen has a 4-inch dead rubber space which is used in progressive gluing operations. In addition, there is a 1-inch, unheated rubber border on the pad. Total electrical consumption is 3 kw.



**ISOLATED FROM PRODUCT by thin aluminum sheet, conductive rubber blanket supplies heat to dry adhesive. Thermostatic control holds temperature at 150 F**

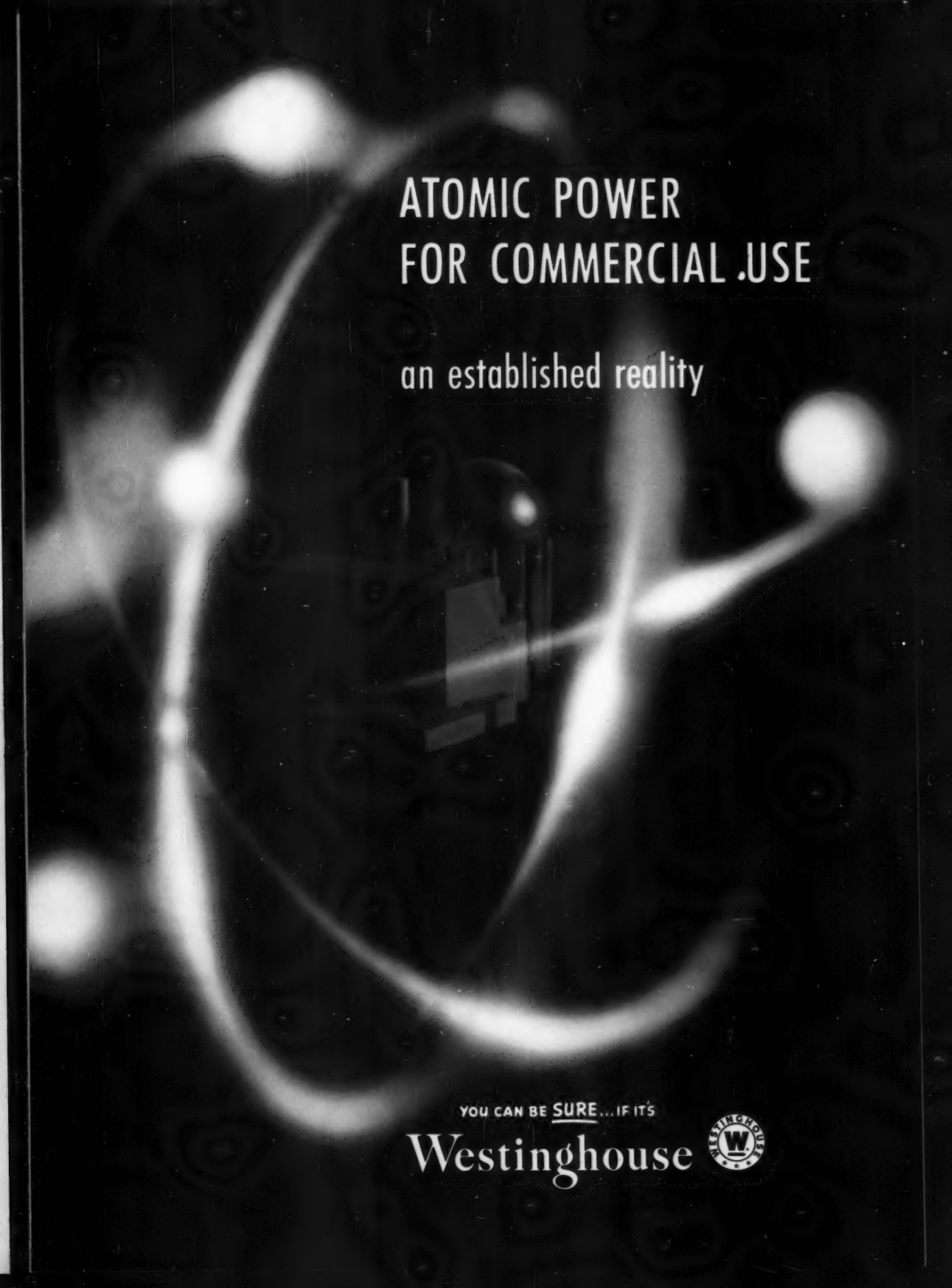
Pressure is applied to the glued wooden panels by inflating six large, flexible fiber hoses which are installed under the lower platen of the bonding press.

# Automatic Handling Cuts Labor At Cement Block Plant

**P. C. WEBB,** Power Sales Engineer, Consumers Power Co, Battle Creek, Mich.

An automatic machine used for moving cement blocks has cut down on heavy, manual labor at Hannah's Cement Block Products in Battle Creek, Michigan. Called a "Rackman", the new machine uses an automatic indexing elevator to take blocks from a conventional cement block machine and load them into racks for moving. These racks are the standard size used in the cement block industry and hold a total of 72 blocks. When fully loaded, they are picked up by a fork lift and taken directly into the steam curing room. The machine has eliminated a considerable amount of hand labor. Cost of electric power for operating this labor-saver is almost negligible.

**HANDLING MACHINE HAS AUTOMATIC INDEXING elevator which moves block from block machine to racks. Fork lift carries loaded racks to steam curing room**


ATOMIC POWER
FOR COMMERCIAL USE
an established reality
YOU CAN BE SURE... IF IT'S
Westinghouse

# This is YANKEE . . .

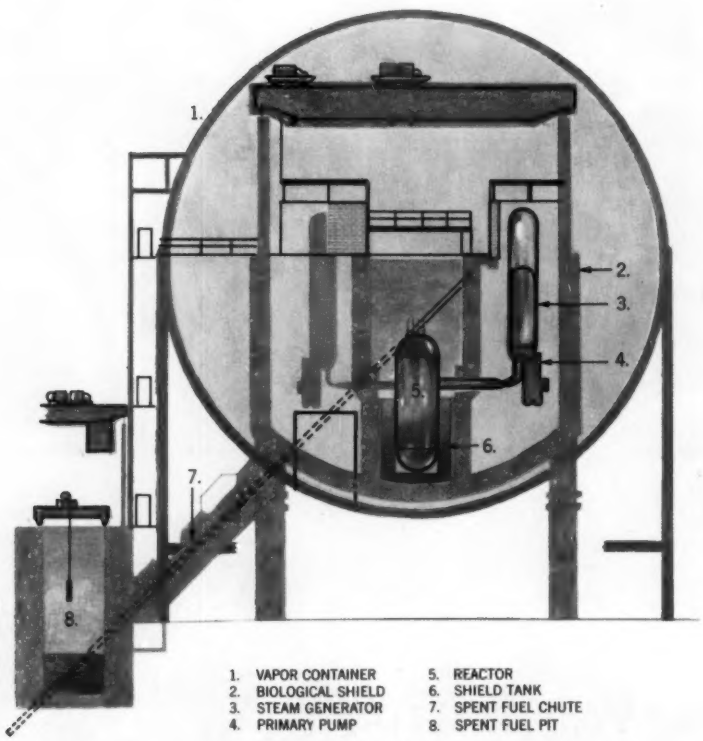
## 134,000 KW Power Generating Station for New England

Yankee Atomic Electric Company is building a 134,000 kilowatt atomic power plant in western Massachusetts near the town of Rowe. The overall design, engineering and construction of this plant is being handled jointly by Westinghouse Electric Corporation and Stone & Webster Engineering Corporation. Yankee's pioneering plant is being sponsored by ten of New England's leading utilities.

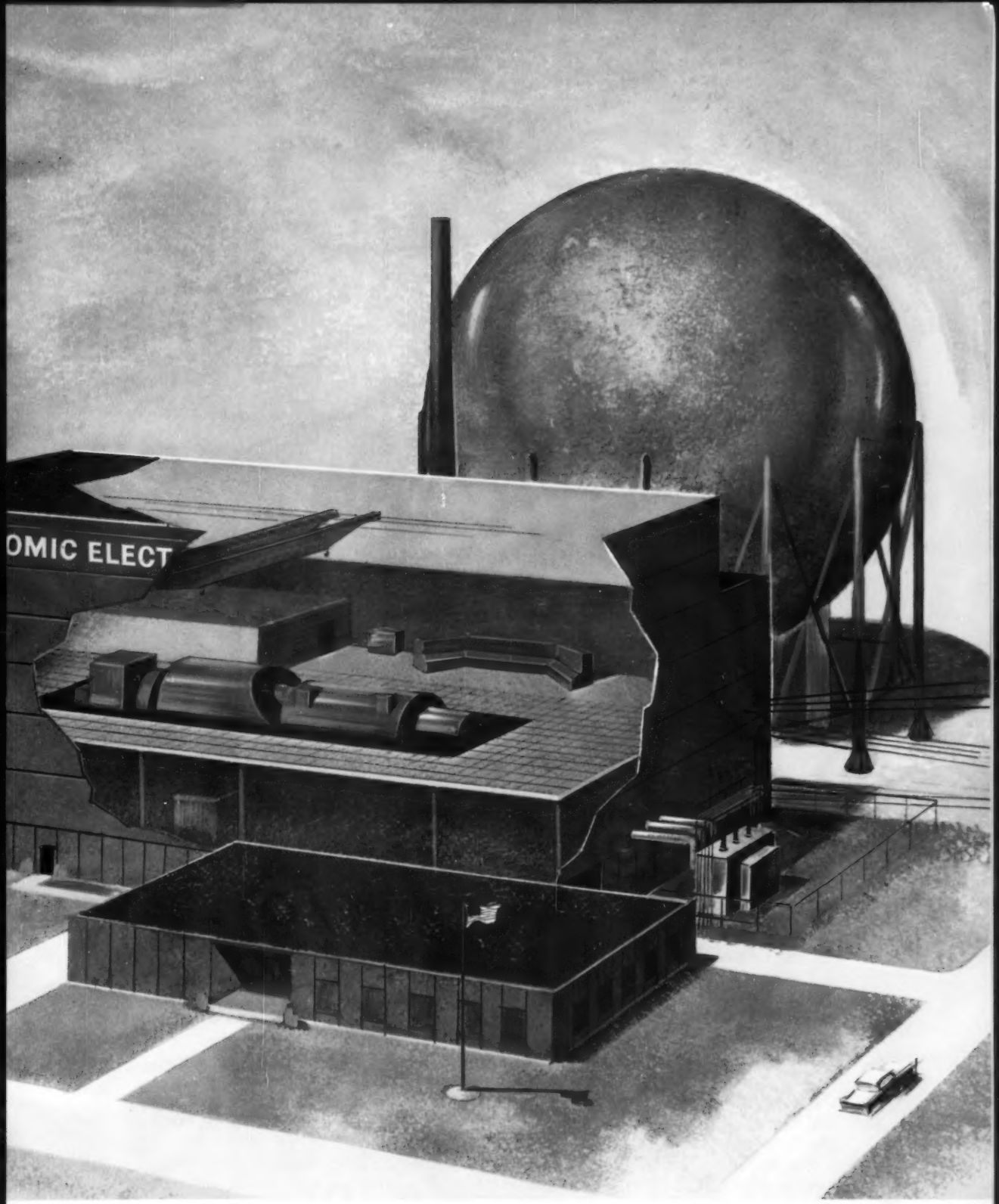
This first atomic power plant in New England will be similar to a standard steam-electric station except for the "boiler" equipment. An advanced, pressurized water, atomic reactor (using uranium as fuel) with its controls, auxiliaries and heat exchangers, will replace the conventional coal or oil-fired boiler.

The research and development program for this project is being financed jointly by the Yankee Atomic Electric Company and the Atomic Energy Commission. The AEC, through its Power Demonstration Reactor Program has agreed to underwrite up to $5,000,000 of this research and development cost. This research will benefit any company which later uses a reactor of this same general type. Yankee Atomic Electric Company has contracted with Westinghouse to carry out the research and design for its atomic reactor.

The Yankee plant is scheduled for initial operation in 1960.




1. VAPOR CONTAINER
2. BIOLOGICAL SHIELD
3. STEAM GENERATOR
4. PRIMARY PUMP
5. REACTOR
6. SHIELD TANK
7. SPENT FUEL CHUTE
8. SPENT FUEL PIT




YOU CAN BE SURE...IF IT'S Westinghouse

This group includes: APD's Technical Director; an advanced development consultant; a staff consultant on core engineering; a specialist on fuel element design and core fabrication; a technical liaison engineer.

## In the atomic power market

# these men are today's best buy

Westinghouse has been a leader in research and in the development of power apparatus for over 70 years. It was to maintain this leadership that the company entered the nuclear field over 18 years ago.

The Atomic Power Department (APD) is responsible for the design, development, application and sale of nuclear steam generators for the generation of electric power and industrial steam and for merchant marine propulsion. APD is also charged with the coordination of applications which involve the complete apparatus which Westinghouse manufactures for atomic power plants.

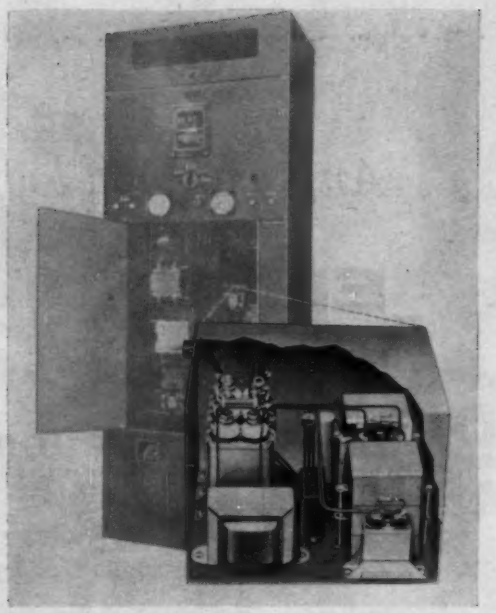
Among the additional projects at Westinghouse Atomic Power Department are: the first large aqueous homogeneous reactor (in partnership with Pennsylvania Power and Light Company); the Belgian Thermal Reactor, the first atomic power generating plant sold in the international market.

Westinghouse is ready — from planning to engineering to production of everything from reactor core to customer's meter. For complete information or assistance, contact your Westinghouse Sales Engineer, or write: Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. AP-4500

YOU CAN BE SURE... IF IT'S Westinghouse

# NEW EQUIPMENT

## Precipitator Control . . .

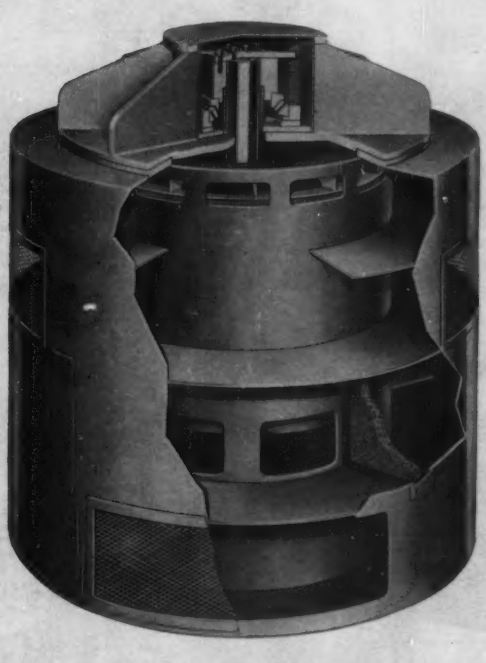


**. . . for collection of fly ash** and dust fumes is fully automatic, and contains no tubes, relays, or moving parts. No maintenance is required on the "Transistomatic" control unit, allowing it to be sealed in electronic potting compound for protection against moisture and dust. Components are "all-static."

As characteristics of the gas stream vary, voltage impressed across the stream is automatically kept just below the "flashover" point, permitting high recovery efficiencies. Sensing circuit integrates total surge current with respect to time, continuously evaluating its rate of flow.

The unit is relatively small in size, and carries a lifetime guarantee.

**Western Precipitation Corp, 1000 West 9th St, Los Angeles 54, Cal.**



## Enclosed Vertical Motors . . .

**. . . have protection against weather** for a new line in ratings of 250 hp and up, available as squirrel-cage or wound-rotor induction or synchronous.

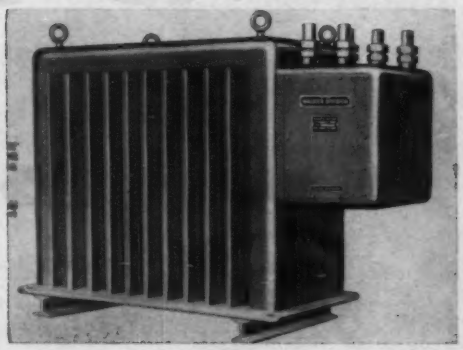
Designed for outdoor use on pump and other vertical drives, they have ventilating passages constructed to keep out rain, snow, and airborne particles. Baffles force air to change direction 90 degrees or more before reaching internal parts, and keep air velocity into the machine below 600 fpm. High velocity air "blows through" without entering internal vent passages leading to electric parts.

Hairpin-shaped, immersion-type space heaters have integral terminal boxes, and are arranged to eliminate inside connections.

"Silco-Flex" all-silicone-rubber stator coil insulation and optional wire-mesh filters are also featured.

**Allis-Chalmers Mfg Co, Milwaukee 1, Wis.**

## Submersible Rectifiers . . .



**. . . of oil-filled silicon type** are available in ratings up to 500 kw. The power supplies are encased in a sheet steel cabinet which measures 90x72x44 in., are oil and water tight, and feature sealed silicon junctions.

Capacities are 50, 100, 150, 200, 250, 400, and 500 kw, with input voltages up to 4,160 v, and outputs up to 250 v dc. Efficiencies are about 95%, and voltage regulation is 5% or better.

**Walker Div, Norma-Hoffmann Bearings Corp, Stamford, Conn.**

(*More New Equipment on page* 114)

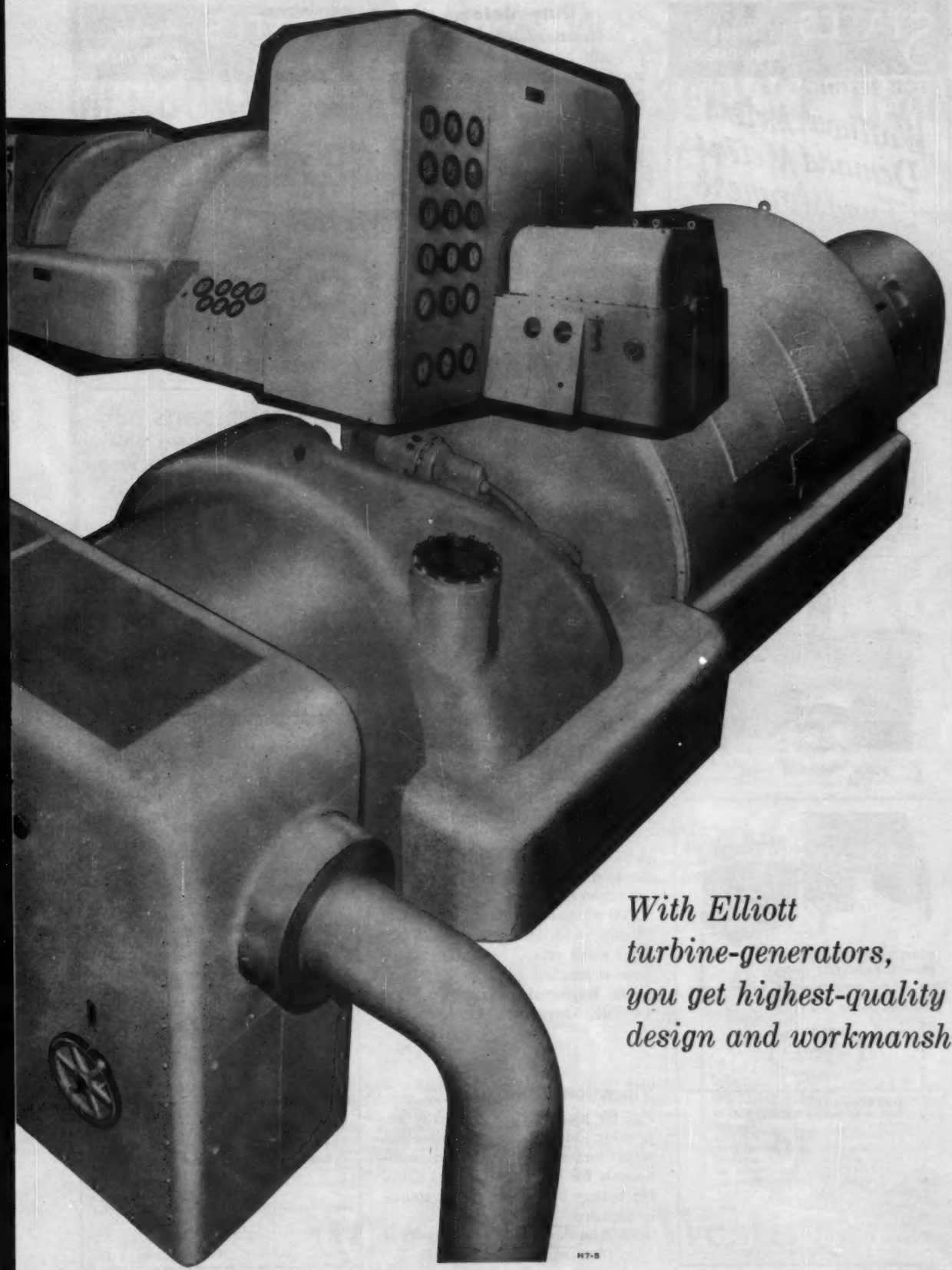
*Any way you look at it...*

# Elliott Turbine-Generators

## are an excellent choice

In the size rating through 44,000 kw, Elliott engineers and craftsmen have combined their skills toward a finer, more perfect turbine-generator unit—capable beyond nameplate rating . . . of extra rugged construction . . . with flexibility over a wide range of loads . . . and highest efficiency. The Elliott hydrogen-cooled unit pictured here is serving a utility plant with distinction. For turbine-generator data, call your nearby Elliott district office or write Elliott Company, Steam Turbine Department, Jeannette, Pa.

**ELLIOTT Company**



*With Elliott turbine-generators, you get highest-quality design and workmanship*

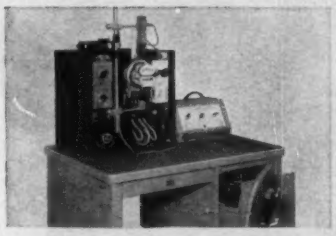
H7-5

STATES TESTING EQUIPMENT

FOR TESTING

*Watthour Meters*
*Demand Meters*
*Transformers*

States complete line of Test Tables are tops in the field for dependability and ease of operation. Each test table designed and developed by States is your assurance of quality and successful meter testing.



**FORM "FHAPBLT" TEST TABLE**
Compact and complete. This versatile table tests single phase and polyphase watthour meters, types A & S. Equipped with photo-electric timer.

**FORM "FRS" TEST TABLE**
**50 amp. capacity**

**FORM "CTT" CURRENT TRANSFORMER TEST UNITS**
One of the many types of current transformer test units built by States. (1000—2500—5000—10,000 amp.)

THE STATES COMPANY
3 New Park Ave., Hartford, Conn.

I am interested in the following equipment:

☐ Watthour Meters ☐ Demand Meters ☐ Transformers

Name..... Title.....

Firm .....

Address .....

City..... Zone..... State.....


## Severe Duty Motors . . .

**. . . in fractional hp ratings** can take frequent hosing down, exposure to corrosives. Designed for food processing, mining, and other difficult applications, they feature totally-enclosed, non-ventilated construction, base welded to stator shell, stainless steel shaft, cast-iron end shields, and corrosion-resistant finish on both internal and external surfaces. Available in hp ratings of 1/6 through ¾ and in speeds of 3,450, 1,725, and 1,140 rpm.

**General Electric Co, Schenectady 5, N. Y.**

## Ground Alert . . .

**. . . for 440-v, 3-phase, ungrounded** systems detects line-to-ground faults and gives both visual and auditory warning. Both types, stationary and portable, indicate faults before a dead short occurs. Any desired minimum resistance to ground, from 7,500 ohms to 0 ohm can be set at factory. Red light goes on and bell rings when pre-set insulation resistance is reached.

**Delta Engineering Sales Co, Box 1403-R, Shreveport, La.**

## Vibration Analyzer . . .

**. . . for machinery** is externally adjustable. Magnification of vibration wave forms can be set instantaneously for 40, 20, 10, or 5:1 ratio. No battery or outside power source is required.

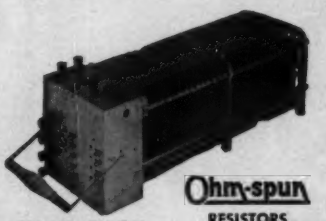
"Vibrograph" records waves of

(*Continued on page* 116)


STATES TESTING EQUIPMENT

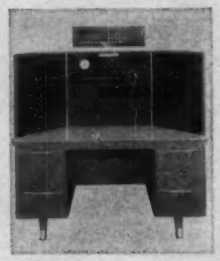
FOR TESTING

*RELAYS*



TYPE "WR" Ohm-spun RESISTORS

**STATES PRESENTS . . .**
a wide range of test tables to meet varied Relay Test requirements.



**RELAY TEST LOAD KIT**

**Catalog No. 3355R—Compact Kit includes Load, Cycle Counter, Rheostat and Control Switches. Smooth current adjustment from .05 thru 58 amperes.**

THE STATES COMPANY
3 New Park Ave., Hartford, Conn.

I am interested in the following equipment:

☐ Relay Test Tables ☐ Relay Loads

Name..... Title.....

Firm .....

Address .....

City..... Zone..... State.....

**INDOORS AND OUT**

# MORE WESTINGHOUSE MERCURY LAMPS ARE IN SERVICE THAN ALL OTHER BRANDS COMBINED

## They're Job-Tailored to give you the most mercury light for your money

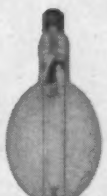
From Westinghouse developments like those below, you can see how the built-in quality of Westinghouse Mercury Lamps gives *more light when new, more light throughout life, as well as guaranteed long life.*

- Thorium-Coated Electrodes provide HIGHER LIGHT OUTPUT
- Molybdenum Ribbon Seals assure GREATER DEPENDABILITY, LONGER LIFE
- Hi-Temp Life-Time Bases eliminate INSTALLATION AND SERVICE BREAKAGE
- *Weather Duty® construction with special "hard" glass. Outside installations can't be harmed by snow, sleet or rain even when lamps are installed without protective coverings . . . or inside by fumes, or dripping condensation.*

For recommendations for using the most complete line of mercury lighting—for the right kind of lamp for the job—call your nearest Westinghouse lamp supplier or write: *Westinghouse Lamp Division, Dept.W-9, Bloomfield, N. J.*

**B-H18: 700 W. Fluorescent-Mercury Lamp.** Color-corrected Golden-White light for general purposes, flood and street lighting. A Westinghouse exclusive!

**E-H1: 400 W. Mercury Lamp.** Most widely used today. For interior and street lighting. **E-H1-Y:** Built-in clear yellow filter warns of road hazards.



**A-H12-WD; A-H15-WD: 1,000 W. Weather Duty Mercury Lamp.** Recommended for all interior application. Widely used by industrial high bay lighting. Weatherproof for heavy duty service.

**A-H1-WD: 400 W. Weather Duty Mercury Lamp.** Recommended for general purposes, flood and street lighting. Weatherproof for heavy duty service.

**P-H1: 400 W. Semi-Reflector Mercury Lamp.** Color-corrected golden white for all interior uses. Ideal for areas of high dust concentration.

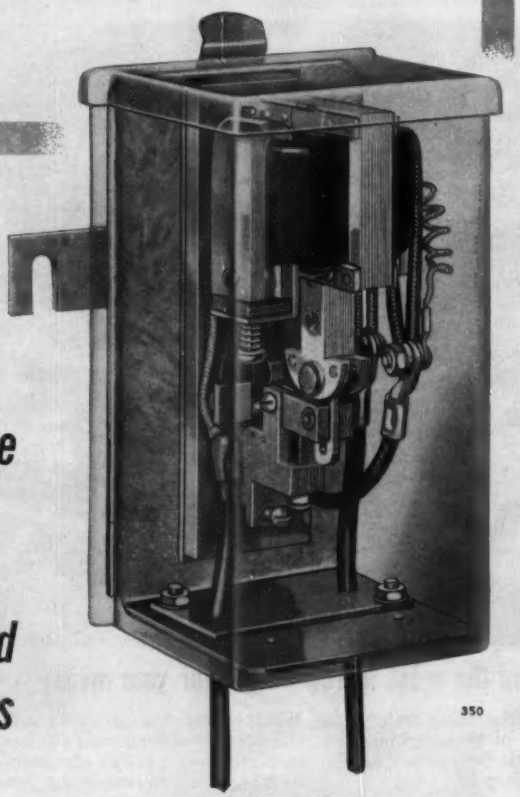
**C-H12-WD; B-H15-WD: 1,000 W. Weather Duty Fluorescent-Mercury Lamp.** Color-corrected golden-white light for general interior and flood lighting. Weatherproof for heavy duty service.

**J-H1: 400 W. Fluorescent-Mercury Lamp.** Golden-White light is color-corrected for interior and street applications. **J-H1-Y:** Rich, yellow light to identify road hazards, ideal substitute for sodium installations.

YOU CAN BE SURE...IF IT'S Westinghouse

# KEARNEY

## AUTOMATIC SECONDARY SECTIONALIZING BREAKER



350

*Saves Maintenance Time and Costs on Banked Secondaries*

**Exclusive Automatic Reclosing**

Installed at neutral points between transformers supplying the secondary bank, the KEARNEY Secondary Breakers adjacent to a faulted section open to protect other sections. Generally, the fault clears itself, and the KEARNEY Breakers then reclose automatically, restoring service to the banked system. On permanent faults, the sectionalizing breakers remain open, isolating the faulted section and preventing cascading of the outage into unaffected circuits.

**JAMES R. KEARNEY CORPORATION,** *General Offices:* **4224-42 Clayton Ave., St. Louis 10, Mo.**

for BETTER CONSTRUCTION
SAFER MAINTENANCE
*Specify* **KEARNEY PRODUCTS**

*Plants at:* ST. LOUIS • FAYETTEVILLE, ARK. • SHENANDOAH & CLARINDA, IA.—GUELPH, ONT., CAN.


## Vibration Analyzer

(*Continued from page* 114)

amplitude and frequency on continuous paper chart. A carbon-shod ball bearing probe is provided for taking measurements directly on surface of rotating shafts.
**The Vibroscope Co, Box 97, Glenford, N. Y.**

## Temperature Monitor . . .

**. . . for power plants** and other installations automatically checks temperatures of up to 40 thermocouples in the range of 100F to 400F every 10 sec. Temperature of any thermocouple can be read from panel meter. Alarm sounds (and flashes) locating any thermocouple that becomes hotter than pre-set temperature.
**Pickard & Burns, Inc, 240 Highland Ave, Needham Heights, Mass.**

## *More New Products*

**High power, high vacuum diode** for charging, shunt, or rectifier applications has maximum peak plate current of 75 amp under shunt conditions.—International Telephone & Telegraph Corp, Components Division, 100 Kingsland Rd, Clifton, N. J.

**200 amp split bus** has branch circuits for 3-wire service, solid neutral, 120/240 v ac. It accommodates 6 double-pole and 16 or 20 single-pole, 15 to 50 amp breakers.—Wadsworth Electric Mfg Co, Inc, Covington, Ky.

**Lighting glassware sampler** gives thickness, weight, and literature references for 9 enclosed lens panels and diffusing glassware samples. Kit furnished free on request.—Lighting Sales Dept, Corning Glass Works, Corning, N. Y.

Weatherproof cast-aluminum **meter housings** have gasketed glass or plastic windows for easy visual inspection of instrument. Explosion-proof housings are also available.—Adelet Mfg Co, 14300 Lorain Ave, Cleveland 11, Ohio.

Two styles of **stationary magnetic disc clutch** have direct action, need no mechanical yokes or shifters. Available in diameters from 4 to 9 in., they have oversized, factory-sealed bearings.—Stearns Electric Corp, 120 N. Broadway, Milwaukee 2, Wis.

From 8 to 20 fused circuits can be handled by "Add-On" **100 amp pull-out.** Fuse sections are attached by screw connections, and additional circuits can be attached easily.—Arrow-Hart & Hegeman Electric Co, 103 Hawthorn St, Hartford 6, Conn.

Bituminous-**presaturated glass yarn** for non-metallic sheathed wire and service-entrance cable permits increased braiding efficiency and improved adhesion to outer finish.—Owens-Corning Fiberglas Corp, 16 E. 56th St, New York.

Snap-on covers permit fast control-panel wiring with low-cost vinyl **plastic wiring ducts.**—Panduit Co, Dept EWN, 10132 S. Washtenaw Ave, Chicago 43, Ill.

Drop of plastic provides **liquid lock-washer** for nuts, screws, and other threaded fasteners. "Locktite" can seal threads at predetermined torque.—American Sealants Co, Hartford, Conn.

Heavy-duty **precision welding head,** the Model 1023, accommodates energy up to 500 w-sec with electrode pressures adjustable between 2 and 50 lb.—Weldmatic Division, Unitek Corp, Pasadena, Calif.

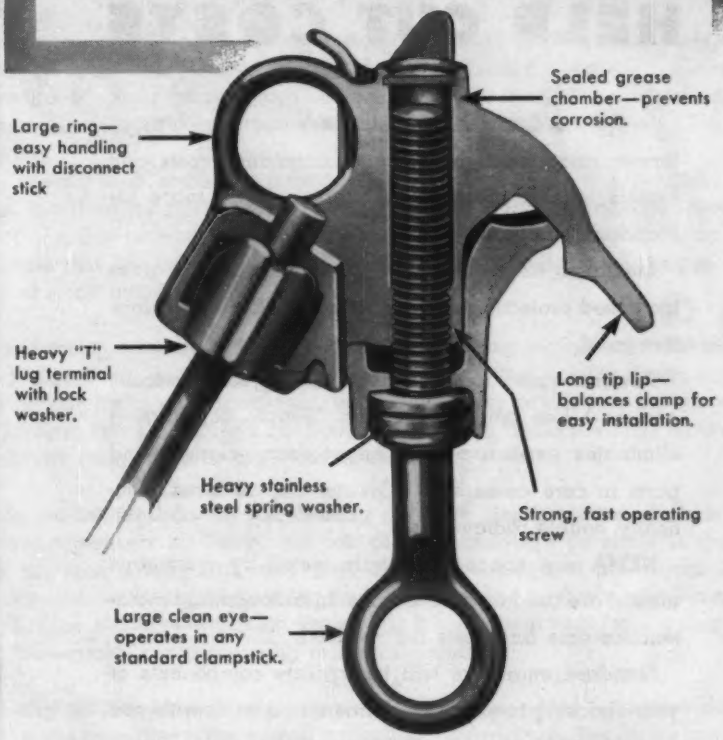
Highly accurate portable **industrial x-ray equipment** for checking welds and castings has trunnion supports which permit head to be positioned easily and precisely.—Mitchell Radiation Products Corp, 128 E. Washington St, Norristown, Pa.

**Wire stripper** removes varnish, asbestos, or glass insulation from heavy round or rectangular wires used in medium-sized armatures, rotors, and transformers. Stripped ends can be controlled to any length between 2 in. and 24 in.—The Eraser Co, Inc, Rush Wire Stripper Div, 1068 S. Clinton St, Syracuse 4, N. Y.


# Tap tight, stay tight ...yet come off easy!

## KEARNEY *Protected Thread*

## CON-NEC-TAP CLAMPS


Large ring—easy handling with disconnect stick
Sealed grease chamber—prevents corrosion.
Heavy "T" lug terminal with lock washer.
Long tip lip—balances clamp for easy installation.
Heavy stainless steel spring washer.
Strong, fast operating screw
Large clean eye—operates in any standard clampstick.

High pressure contact under all conditions! Strong, double coil spring lock washer prevents loosening of Clamp . . . compensates for expansion and contraction of Clamp or conductor. Fully sealed in a grease filled chamber, the protected thread screw can't corrode. No matter how long they've been on the line, you never have to cut KEARNEY Con-nec-tap Clamps from the conductor. They're easily removed . . . ready for re-use!

351

**JAMES R. KEARNEY CORPORATION,** *General Offices:* **4224-42 Clayton Ave., St. Louis 10, Mo.**

for BETTER CONSTRUCTION
SAFER MAINTENANCE
*Specify* **KEARNEY PRODUCTS**

*Plants at:* ST. LOUIS • FAYETTEVILLE, ARK. • SHENANDOAH & CLARINDA, IA.—GUELPH, ONT., CAN.

# Standard®

# Transformer's DESIGN FEATURES HELP CUT COSTS

● Standard Transformer's attention to transformer components helps cut maintenance costs and boosts transformer life, yet you pay no more for Standard equipment.

Insulation exceeds all ASA specifications and gives increased protection against flashover. Coils are moisture-proof.

Power-sheared laminations minimize short circuits and core loss caused by burrs. Simple construction eliminates expensive and unnecessary clamps and parts in core assemblies. Greater coil surfaces practically double radiated heat.

NEMA size connectors, strain tested by mercurous nitrate, are used on all bushings. Installation and maintenance time and costs are reduced.

Standard engineers will incorporate components of your choosing in your transformers and work with you to design the transformers best suited to your needs.

**WRITE for your new Standard Single-Phase Transformer Bulletin S-401-B. It's ready now!**

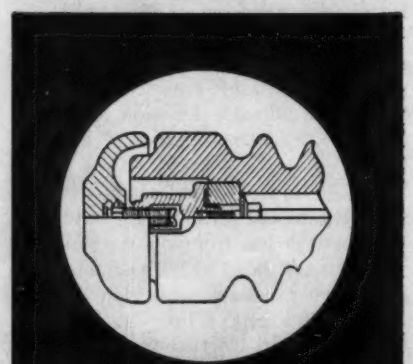
Standard®

**THE STANDARD TRANSFORMER COMPANY**

**WARREN, OHIO**
**REPRESENTATIVES IN PRINCIPAL CITIES**

**UNIFORM SEAL**—This Standard design feature creates a four-point contact that assures a positive seal completely around the transformer cover. A Neoprene gasket seals out all dust and moisture.

**TAP CHANGER**—Your transformers can be equipped with four taps above or below, or half above and half below, as you specify. The switch embodies a contact-making assembly with a spring-loaded brass wheel for positive contact. Normal settings are with a four-tap voltage section. 2½% taps within 10% range of normal rating.



**TANK WALL BUSHING**—Permits line insertion without tools. No exposed live parts. Terminal compression stud keeps insulated plastic cap from falling off when unscrewed to receive primary leads. Cables enter from either side. Pressure from clamping shoe holds lead securely.

# ELECTRICAL BUSINESS OUTLOOK

**Electrical World**
SEPTEMBER 23, 1957

**Last week produced two mixed clues on the business outlook**—a slightly pessimistic note on capital expenditures and a slightly optimistic note on housing.

**Outlays for new plant and equipment may take a mild dip in the 4th quarter,** according to the latest projections by SEC and Dept of Commerce. While capital spending is now running at a record $37.2 billion, it's expected to drop off by $60 million in the last three months of '57. Though small, this would be the first quarter-to-quarter dip since the capital goods boom started way back in 1955.

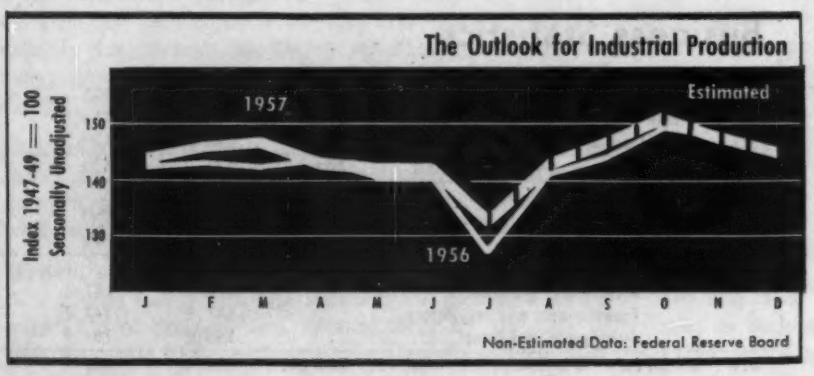
**But there's no sign of such a dip for electric utilities.** While capital outlays by industry as a whole slide down a fraction from quarter to quarter, utilities will invest 2.4% more for new plant and equipment. To hitch this to a frame of reference, 4th quarter '56 saw total outlays up 1.7%, utility outlays up 3.7%.

**On the housing front, starts in August jumped to an annual rate of 1,010,000**—the best month so far this year. And FHA applications took a dramatic spurt. It's sort of a late pick-up for this year's home-building slump, but the figures do indicate that the housing market has definitely rebounded from the rock-bottom of a few months back.

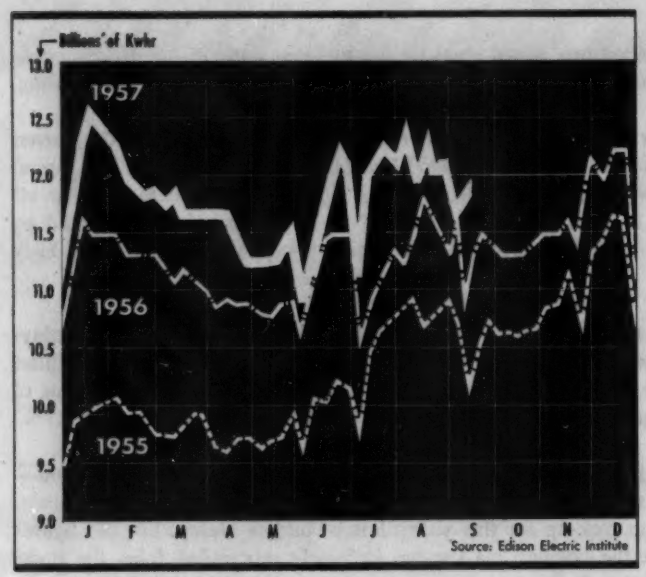
**And the housing recovery is just getting started,** predicts a spokesman for the F. W. Dodge Corp. With population growing, old buildings coming down, and people moving about at a record rate, basic demand for new homes has never been stronger, says Dr George Cline Smith. And 1957's "underbuilding" should make houses spring up even faster during the next few years.

**Actually capital expenditures and housing are quite closely related.** Both are competing vigorously for funds, and one of home-building's problems is that money has been flowing into other more attractive channels of investment. If there is a letdown in capital spending in '58, the money market would loosen up a bit. Then housing—which has shown that it can turn around from a slump pretty fast—could be counted on to pick up the slack.

**For electric utilities this shift in money would show up as added residential load** which should more than offset a small cutback in industrial use. Per capita home consumption keeps on rising. M. B. Wyman of Westinghouse cites the 10,000 kwhr house which is with us now, and points out that gains in popularity of electric heating and air conditioning can double that figure.



# STATISTICS




## OUTPUT

**Week ended Sept. 14, 11,947,000,000 Kwhr Up 5.4%**

Per Cent Change From Previous Year

| | Aug. 31 | Sept. 7 | Sept. 14 |
|---|---|---|---|
| Total U. S. | + 5.0 | + 6.6 | +5.4 |
| New Eng. | + 3.6 | + 5.8 | +6.0 |
| Mid. Atlan. | — 1.4 | + 2.9 | +7.1 |
| Cent. Ind. | + 2.8 | + 4.2 | +2.1 |
| West Cent. | + 6.1 | + 8.4 | +3.0 |
| Southeast | + 5.5 | + 7.7 | +7.1 |
| South Cent. | +16.6 | +16.1 | +6.5 |
| Rocky Mount. | + 2.8 | + 2.1 | +3.8 |
| Pacific | | | |
| NW | + 9.4 | + 8.1 | +5.8 |
| SW | + 7.9 | + 7.6 | +8.6 |

Seasonally Adjusted Index 229.0
Week Ago 227.5
Year Ago 215.8

Atomic Energy Commission requirements—1,050,000,000 Kwhr (Electrical World estimate). Excluding AEC, output increase was 6.7%

## Power Statistics . . .

| | | Latest Month | Preceding Month | Year Ago | Annual Change % |
|---|---|---|---|---|---|
| Capacity | July | 124.99 | 124.43 | 117.54 | 6.3 |
| Peak—Class 1 Systems. million kw | May | 97.8 | 97.7 | 92.8 | 5.4 |
| Estimated Dec. '57 Peak | June | 113.6 | 113.6 | 114.4 | —0.7 |
| Production—billion kwhr | July | 54.35 | 52.05 | 49.45 | 9.9 |
| Hydro | | 10.81 | 11.18 | 9.91 | 9.1 |
| Fuel | | 43.54 | 40.87 | 39.54 | 10.1 |
| Sales—billion kwhr | June | 46.99 | 46.60 | 44.46 | 5.7 |
| Residential | | 11.91 | 11.86 | 11.02 | 8.1 |
| Commercial | | 7.90 | 7.38 | 7.29 | 8.4 |
| Industrial | | 24.64 | 24.89 | 23.72 | 3.9 |
| Other | | 2.54 | 2.48 | 2.42 | 5.0 |
| Fuel Consumption | July | | | | |
| Coal—million tons | | 12.72 | 12.50 | 12.00 | 6.0 |
| Oil—million barrels | | 5.51 | 6.24 | 4.32 | 27.5 |
| Gas—billion cu ft | | 158.91 | 125.72 | 136.97 | 16.0 |
| Net Income Class A & B Co's $—million | June | 109.69 | 101.75 | 101.54 | 8.0 |
| Residential Customers—millions | 12 mos. | 46.26 | 46.16 | 44.99 | 2.8 |
| Revenue per kwhr | ended | 2.58¢ | 2.58¢ | 2.62¢ | —1.5 |
| Avg kwhr per customer | June 30 | 3,063 | 3,047 | 2,879 | 6.4 |
| Avg annual bill | | $79.03 | $78.61 | $75.43 | 4.8 |

## Business Statistics . . .

| | | | | | |
|---|---|---|---|---|---|
| Indexes: 1947—49 = 100 | | | | | |
| FRB Industrial Production | July | 144 | 135 | 142 | 1.4 |
| ENR Construction Cost | Sept. | 154.7 | 154.8 | 147.8 | 4.7 |
| BLS Cost-of-living | July | 120.8 | 120.2 | 117.0 | 3.2 |
| New Orders for Machinery (1950 = 100) | July | 146 | 153 | 146 | n.c. |
| NEMA Sales | | | | | |
| Insulation materials | July | 127 | 140 | 117 | 8.5 |
| Electric appliances | | 101 | 93 | 111 | —9.0 |
| Wholesale prices | June | | | | |
| Motors and generators | | 141.0 | 141.3 | 132.3 | 6.6 |
| Transformers and regulators | | 147.8 | 147.7 | 138.2 | 6.9 |
| Switchgear and fuses | | 166.0 | 165.9 | 152.3 | 9.0 |
| GNP—annual rate—$ billion | 2nd qtr. | 434.4 | 429.1 | 410.8 | 5.7 |

# MANAGEMENT BULLETIN

**FINANCE**

**Yields on new corporate bond issues rated triple "A"** increased from about 4% to around 4.75%, or by about 20% in the last twelve months. It can be assumed the rate on bonds with lesser ratings increased at least in proportion. In the same period the Dow-Jones utility stock average showed a decline of 1%.

**If there is reflected an average increase in common stock** earnings per share of around 7% during this period, the resulting increase in the cost of common stock money would be about 7.5%.

**If preferred stock yields are assumed to have risen** at least as much as triple "A" rated bonds, we find that on an assumed capitalization of 62½% in senior securities and 37½% common stock equity, indicated overall weighted average increase in cost of money during the past year would be over 15%.

**This increase might well be introduced as a factor** in pending rate cases and might serve to justify initiation of new applications for rate increases where the return on the investment has been marginal.

**RATES**

**One company is asking the public service commission for a rate increase** while another is planning a cut. Boston Edison Co is requesting a $2,488,000 a year rate hike of which $720,000 will come from residential, $688,000 from commercial, $991,000 from industrial, and $89,000 from street lighting.

**Mississippi Power & Light Co has filed revised rate schedules** which will cut revenues by some $616,000 a year. It will affect residential and small commercial customers. It will become effective on bills rendered after September 4. New rates, says the company, will encourage and enable the home owner to enjoy the full benefits of an all-electric home. In addition, the revised schedules will help "to meet the serious competitive threat of subsidized tax free public power that is steadily encroaching on the company's service area, particularly in the Northeastern Division."

**EMPLOYEE RELATIONS**

**Having trouble competing with "industrial giants"** for technical and executive talent? Coll Associates, Box 224, Lansdowne, Pa., says it may be able to get the men you need while cutting your recruiting expenses to one-third the $17,000-cost of maintaining a company recruiter. The firm says it presents to clients "pre-sold applicants" found through extensive testing. This method also tends to reduce turnover in the first years, they claim.

**Are you interested in supervising people better?** If so, you may want to obtain a copy of the new 112-page handbook for supervisors entitled "Human Understanding in Industry" by Dr William C. Menninger and Dr Harry Levinson, both of the Menninger Foundation.

**Some of the topics covered are:** The relationship between the supervisor and his men; how people get the way they are; what personality consists of; how personality protects itself, the "safety value", etc; seeing the other fellow's point of view; and making the most of our precious resources, manpower. A "Leader's Guide", for use in conducting group discussions, is also available.

**Copies may be obtained** by writing Science Research Associates, 57 West Grand Ave, Chicago 10, Ill. Prices: Single copies, $2.25 each; group training orders, 25 or more copies, $1.75 each; Leader's Guide, 50¢ with one copy supplied free with purchase of each 10 copies of "Human Understanding in Industry".

**History, purpose, and principles underlying present labor law** are explained in a 30-min sound slide-film available for general distribution. The film cites initial use of property and criminal laws for deciding labor cases in early 1800's, tracing history of labor laws through the World War I Labor Board,

the NRA, the Norris-LaGuardia Act, the Wagner Act, and finally the Taft-Hartley Law. Entitled "You and Labor Law," the film reviews labor law objectives and summarizes more than a decade of interpretation. The film is available through Employers Labor Relations Information Committee, Inc., 33 East 48th Street, New York 17, N. Y.

**TAXES**

**Consumers Public Power District, Columbus, Neb., proposes paying more taxes** in 257 incorporated cities served at retail. Tax would be on gross revenue from the retail sale. CPPD presently pays about $315,000 yearly in lieu of taxes. If the CPPD proposal passes a 1958 public vote, tax payments will about double. The additional payments, when added to present "in lieu of tax" payments, would equal 5% of the gross retail electric revenue within the city or village, CPPD reports, and would constitute a full tax liability of CPPD to the state and local taxing agencies.

**CO-OPS**

**REA has approved loans totaling $2.7 million** for cooperatives in Georgia, Indiana, Louisiana, Michigan, North Carolina, Oklahoma, and to a public power district in Nebraska. Of the total, $50,000 goes to Roanoke Electric Membership Corporation, Rich Square, N. C., to help about 110 members finance purchase and installation of wiring, plumbing and fixtures, and various electrical appliances and equipment.

**"What's All This about a $42 Million Loan from REA"** is the title of a booklet just published by the Indianapolis Power & Light Co. It concerns a request by a group of nine Indiana electric co-ops which formed "Hoosier Cooperative Energy, Inc," and applied to REA for a $42 million loan. This will be larger by far "than any loan ever granted by that government agency in its 22-year history."

**If you would like a copy of the booklet,** write James A. Carvin, ad director, Indianapolis P&L, 25 Monument Circle, Indianapolis, Ind.

**AREA DEVELOPMENT**

**EEI announces its Fourth Annual Workshop** which will be centered about the theme "Area Development Produces Prosperity." Workshop will be held Oct. 9 in Lexington, Ky. Speaker topics include, "The Importance of Community Betterment to Industrial Development," "Federal Highway Program and Its Influence on Area Development," "Bankers, Role in Area Development," "Opportunities in Resort Development," and "Urban Redevelopment of Fort Worth."

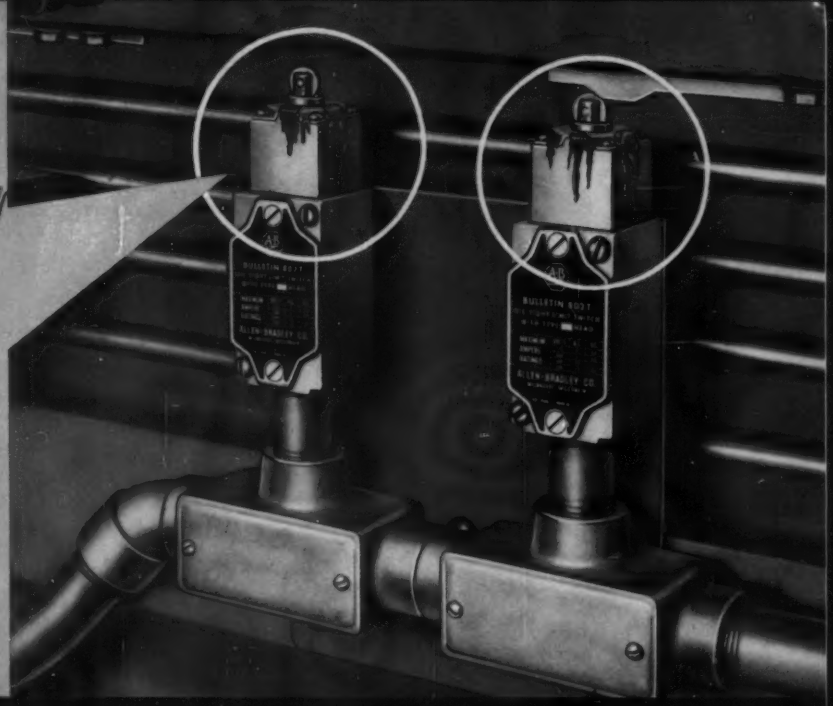
**ADVERTISING**

**Alabama Power Co plugs heat pumps in a recent ad** using a "satisfied customer" testimonial. Headlined "Doubts Quickly Erased," the ad pictures a house and its owners, Mr & Mrs John H. Harris, Jr, of Geneva, Ala. Harris testifies: "Since the use of heat pumps in residences was a comparatively new thing in 1953, I was naturally a bit skeptical about the operating cost. These doubts, however, were quickly erased because after several years I am happy to say that I am completely satisfied with the use of my heat pump and I heartily recommend its use for anyone who is interested in year-'round comfort twenty-four hours a day."

**PUBLIC RELATIONS**

**"Come in, relax, and cool off."** This invitation was extended by Wisconsin Utilities Assn to persons attending the 1957 State Fair. Inside the air-conditioned building, the people found comfortable seats, pleasant music, and a water cooler. While there they heard two expert speakers describe the contributions of electricity and gas to the convenience of modern living. An exhibit contrasted modern kitchens with a "kitchen of yesteryear."

# Completely Oil-Sealed!



A-B QUALITY

802TC Side Push Rod Type

802TF Rod Type

802TA Roller Lever Type

802TB Top Push Rod Type with Plastic Window

802TAO Roller Lever Type for Cavity Mounting

802TG Adjustable Roller Lever Type

## SEALED HEAD KEEPS OUT OIL, COOLANT, METAL CHIPS ...your guarantee of reliable limit switch operation!

With *completely sealed* operating heads, as well as sealed switch bodies, Allen-Bradley Bulletin 802T oiltight limit switches provide maximum reliability in limit switch operation for your modern, high speed production machines. The sealed head excludes oil, dirt, and metal chips from the operating mechanism ... the spring return, momentary contact operators cannot become sluggish and stick.

The maintenance free, double break, silver alloy contacts are sealed in the oiltight body. Interchangeable operating heads are available with various push rods and levers which can be mounted in any one of four positions. Oiltight transparent plastic covers, for inspecting contacts and wiring without removing the cover, are available for most units.

Here's a line of *quality* limit switches in which each type will provide millions of trouble free operations. Have your A-B control engineer acquaint you with this latest development—another advance in limit switch design.

**ALLEN-BRADLEY**
**MOTOR CONTROL**
QUALITY

**Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.**
**In Canada: Allen-Bradley Canada Ltd., Galt, Ont.**

9-57-MR

# NOW... ALLEN-BRADLEY PRECISION-TYPE LIMIT SWITCHES ARE ALSO OILTIGHT!

**OILTIGHT HEAD** — Newly designed head on push type seals out oil. Roller lever types have sealed operating shafts.

**OILTIGHT BODY** — Synthetic rubber gasket between housing and plate excludes oil and coolant from operating mechanism.

Allen-Bradley precision-type limit switches combine very close operating tolerances with such a sturdy construction that they can be used for any industrial application. Now this line of limit switches has been further improved by making them completely oiltight.

Especially designed for use where the motion to operate the limit switch is measured in thousandths of an inch, these Allen-Bradley limit switches can henceforth be employed in applications where oils, coolants, and dust are present.

Allen-Bradley Bulletin 802 oiltight precision limit switches have a positive snap action mechanism which prevents any possibility of a "dead center" . . . no matter how slowly the actuating force is applied. They are available in both the spring return and maintained contact construction. And all have maintenance free, double break, silver alloy contacts.

Specify these Allen-Bradley oiltight limit switches where "precision" operation is required and where dirt and oil could cause trouble.

Push rod type. Plastic cover, for inspection without removing cover, made for most units.

Roller lever type limit switch with lever on right side. Also available with lever on left side.

Roller lever precision-type limit switch with roller lever in front of the switch body.

## ALSO—GENERAL PURPOSE LIMIT SWITCHES

Bulletin 801 general purpose limit switches in standard or heavy duty ratings. Maintained or momentary contacts with slow or snap action. Silver alloy contacts used throughout this line.

ALLEN-BRADLEY
MOTOR CONTROL
QUALITY

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.
In Canada—
Allen-Bradley Canada Ltd., Galt, Ont.

A-B QUALITY

9-57-MR

# Large C. H. Wheeler Condenser Shipped

**. . . to Con Ed, Astoria, designed for use with 335-Mw turbine**

Condenser with 187,000-sq-ft cooling surface to condense 1.6-million-lb of steam per hr has been shipped by C. H. Wheeler Mfg Co, Philadelphia, to Consolidated Edison Co's Astoria, N. Y., station. Shown is the first half of the condenser which is one of the largest built.

This twin-shell single-pass, triple-lane heat exchanger will serve turbine-generator No. 3, a cross-compound unit rated 335,000 kw. Steam conditions are 2,000 psig, 1,050F superheat, and 1,000 reheat. Design calls for 1.87-in. vacuum with a water temperature of 73F. Each unit is 26-ft 10-in. high, 47-ft 4.5-in. long, and 23-ft wide. When dry, the condenser weighs 673 tons; service weight totals 1,092 tons.

Low pressure element of the turbine has a 10-stage double flow arrangement. Each end of the turbine will connect with one unit of the twin-shell condenser. To balance steam pressures, the two shells are connected by a steam duct with a 74-in. diameter.

Single-stage pull-out type vertical mixed flow Wheeler pumps will supply the condenser cooling water. With a rating of 122,000 gpm against a head of 17.5 ft, they have a 72-in. suction and a 72-in. discharge.

Condenser and pumps are now under construction for an identical unit at the Arthur Kill station.

## S&C Produces Disconnect Used with Loadbreak Tool

A tool-operated disconnect switch for distribution service will be marketed by S&C Electric Co, Chicago.

This load-switching device is rated at 15 kv, 400 amp. It is designed for use with the Loadbuster, S&C's portable loadbreak tool. Because the tool can be brought to the disconnect when needed, its cost can be spread over all the disconnects and cutouts on the system.

## Marathon Millionth Motor

The one-millionth Marathon electric motor was presented by J. J. Wall, president of Marathon Electric Mfg Corp, Wausau, Wis., to F. P. Maxwell, vice-president of Rockwell Mfg Co's Delta Power Division. The presentation was an occasion marking the 25th anniversary of an uninterrupted business association between the motor and machine manufacturers.

## Okonite Awarded Contract for Champlain Cables

Okonite Co, Passaic, N. J., has been awarded a $270,000 contract to manufacture submarine cable for transmission of St Lawrence power across the upper part of Lake Champlain into Vermont.

The power at 115 kv will originate from the project of the Power Authority of the State of New York. Rated at 125 Mva, the installation will consist of four parallel circuits. Each cable will be oil-filled and consist of three main conductors and a spare. Maximum water depth expected for each 9,000-ft cable is 200 ft.

Delivery, scheduled for early May, 1958, is planned to be made by water.

## Exide, Ray-o-Vac Combine

Electric Storage Battery Co and Ray-o-Vac Co directors contemplate combining business and assets.

(*More M & M on page* 126)

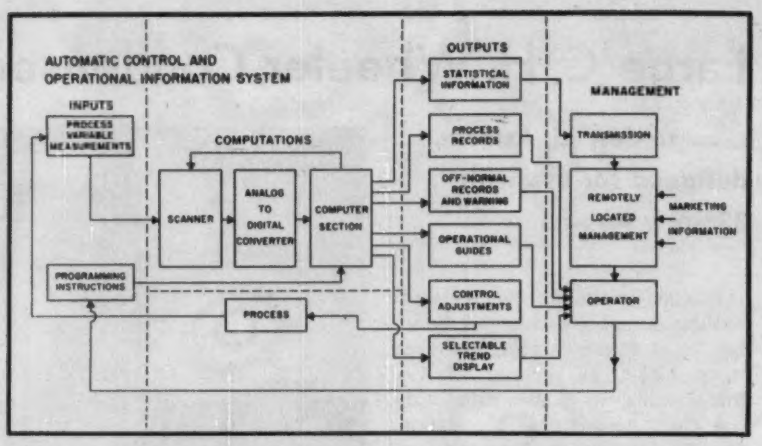
# Daystrom Automizes T-G Information

First installation of a Daystrom operational information system will be made by the newly formed Controlonics Group, Daystrom Inc, at a new 200-Mw turbine-generator unit of the Sterlington Steam Station of Louisiana Power & Light Co.

W. T. Hess, vice president and chief engineer of the utility, describing the installation said, "When the new Sterlington unit begins operations, we believe it will represent the most advanced method of producing electricity in the world today."

According to C. E. Jones, general manager of Daystrom Systems, "The system is one of the major components necessary for full automatic control and is not merely an interim measure. It represents the closest step to date in 'closing the process loop', that is, to achieve completely automatic control of the entire plant without the need for any human control other than programming of the computer to correct any variation from optimum operation."

The system, shown in the accompanying block diagram, is scheduled for operation by March 1, 1958.




This operational information system will cover measurements at 350 points throughout the power plant. Of this total, 100 points will be automatically logged every hour. Continuous scanning of the remaining points with a read-out on a separate printer if they exceed set limits is provided. Literally, all the information for plant operation is at the fingertips of one man.

System design uses solid state electronic equipment. Components used throughout are transistors and all relays are the wetted mercury computer type. Also included in the system is the first industrial use of a transistorized digital computer and the DADIT, a transistorized analog to digital convertor.

Controlonics Group is composed of three Daystrom units: Weston Electrical Instrument Corp, manufacturer of electrical indicating instruments; Daystrom Systems Division, an automatic systems research group; and Daystrom Electric, maker of industrial instruments, recorders and controllers, and electronic equipment.

## Half of '57 ORSRT Grads In Electrical Industry

Largest class in the history of the Atomic Energy Commission's Oak Ridge School of Reactor Technology (ORSRT) has recently completed its training course. About half of the graduates were from 20 electrical product manufacturers.

Of the 111 graduating students, 55 were representatives of the 20 firms. Other members of the class represented 9 other manufacturers and electrical utilities and 7 government agencies and departments.

## Accelerator for Rent

Now available for testing the effect of radiation on materials or for production use is a 2-Mv Van de Graaff accelerator at High Voltage Engineering Corp, Burlington, Mass. The machine will be rented on a time basis to industrial concerns, research laboratories, universities, and other groups. Further information can be obtained by writing the company for bulletin F.

## Cuban Utility Orders $5 Million GE Equipment

Cia Cubana de Electricidad, S. A., one of the operating companies of the American & Foreign Power System, has placed orders totalling nearly $5 million for electric power generating and distributing equipment with General Electric Co.

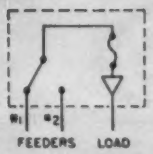
Equipment ordered will increase the Cuban electric utility's capacity 32%. Included in the orders were a 33-Mw steam turbine-generator unit, two 22-Mw units, 21 ARA cubicle-type air circuit breakers rated 1,200 amp, I.C., 1,500 Mva, and four oil-filled 25,000 kva, 110 -34.5-kv power transformers.

## Kaiser to Produce Flattened Aluminum Wire

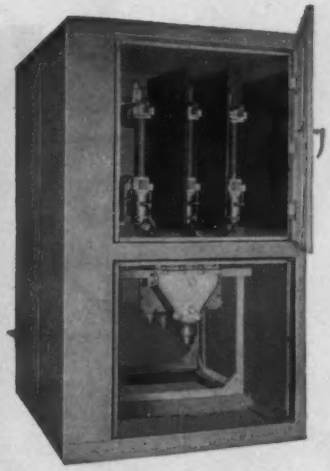
Round edge flattened aluminum wire for electrical products will be obtainable shortly from Kaiser Aluminum & Chemical Sales Inc. Thicknesses ranging from 0.20 to 0.187 in. and widths from 0.063 to 1.000 in. will be produced by a recently installed wire flattening mill at the company's Newark, Ohio, plant. The wire product will be available in E. C. grade and in alloys 1100, 3003, 5052, and 5056.

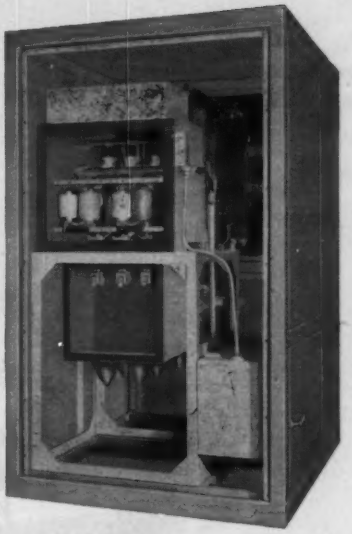
Applications are transformer windings, current limiting reactors, welding transformers, armor for electrical cable, electromagnets, and d-c generators.

"SC-RAD-F" UNICLAD, including: Feeder selector oil switch, 3 pole, 15 Kv., 400 amp. full load break; with Model "F" automatic transfer mechanism. "SC" power fuses and pothead for load connection.



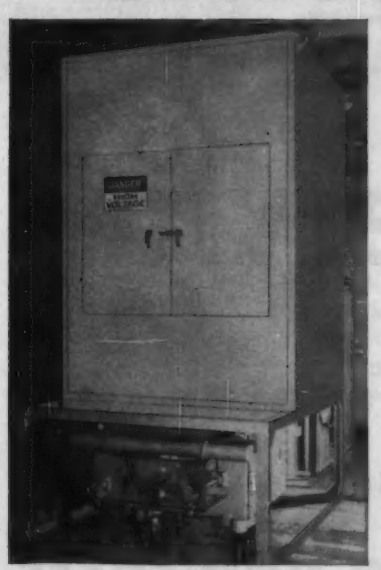

Right side opened to show disconnecting type power fuses and load cable pothead. The pothead can be 3 conductor as shown or 3 single conductor.





Left side panel and cover plates removed to show details of oil switch (with control transformers) and of cable terminating compartment. Also note Model "F" automatic operating mechanism. Oil switches can be furnished for full load break manual operation instead of automatic.

# G&W UNICLAD SAVES INSTALLATION & MAINTENANCE COSTS



Loop feeder "RAL" load center oil switch, 3 pole, 34.5 Kv., 400 amp. full load break—Power fuses and current transformers in upper compartment—Load transformer in rear.

## Primary Service Switch-Fuse Units *enclosed in metal cabinets for safety and appearance.*

G & W combination load break oil switch-fuse primary service units—in economical functional designs have been furnished for many years. They help maintain service continuity and provide load circuit protection. They have a remarkable record of trouble-free operation—with a minimum of maintenance.

The oil switches, fuses and other component parts are now factory assembled as UNICLAD metal enclosed units—which present a neat and harmonious appearance in indoor or outdoor locations. The enclosure of porcelain bushings, live lugs and connections promotes safety.

The arrangement of equipment within the UNICLAD enclosure is such that ready access is provided for termination of feeder and load cables, for maintenance of oil switches and mechanism and for replacement of fuses.

UNICLAD switch-fuse units are custom designed for practically any primary service center requirements. The load break oil switches may be manually operated or fitted with operating mechanism for automatic transfer of feeder circuits, as illustrated.

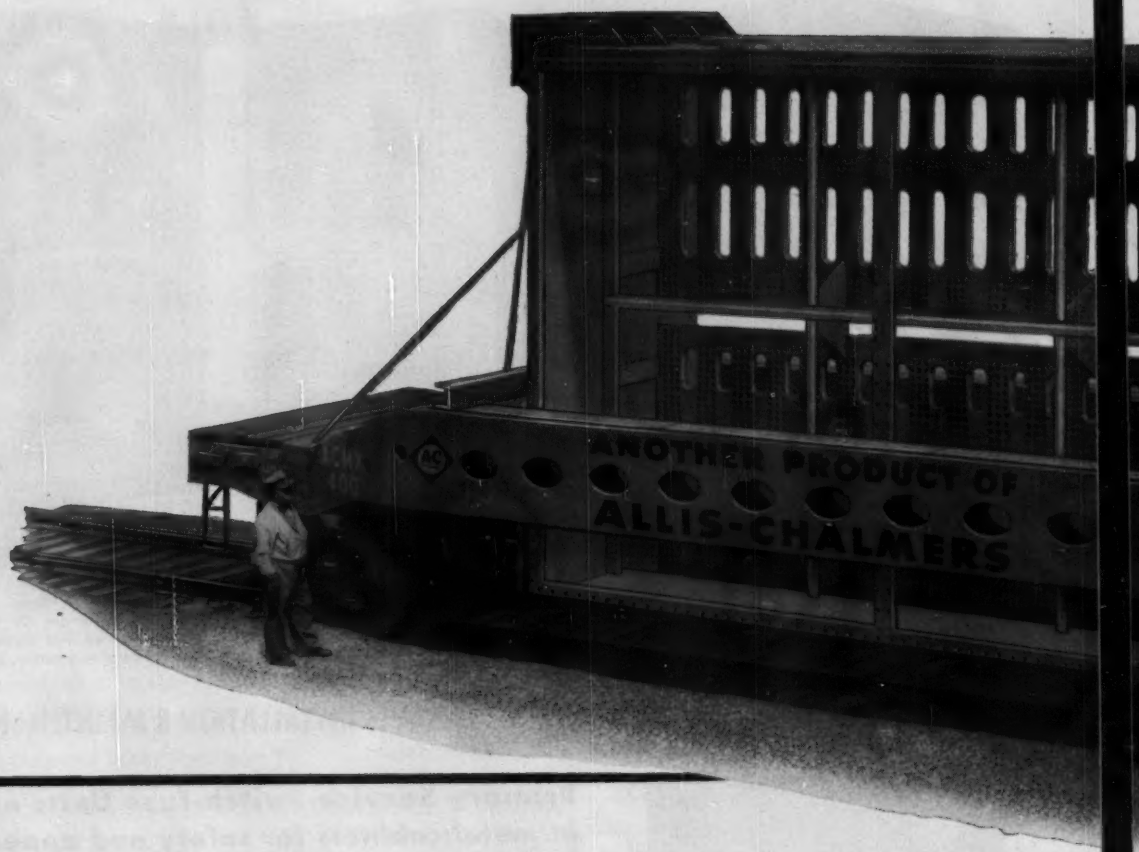
***For further information, write us or our nearest representative.***

## G&W ELECTRIC SPECIALTY COMPANY
## 3500 W. 127th ST., BLUE ISLAND, ILLINOIS

CD572 Representatives in many cities of U. S. A., N. & S. America Canadian Mfr. - Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

**High Voltage Cable Terminating, Sectionalizing, Protecting, and Connecting Devices**

**POTHEADS • BOXES • OIL FUSE CUTOUTS • LOAD BREAK OIL SWITCHES • SPLICING KITS**



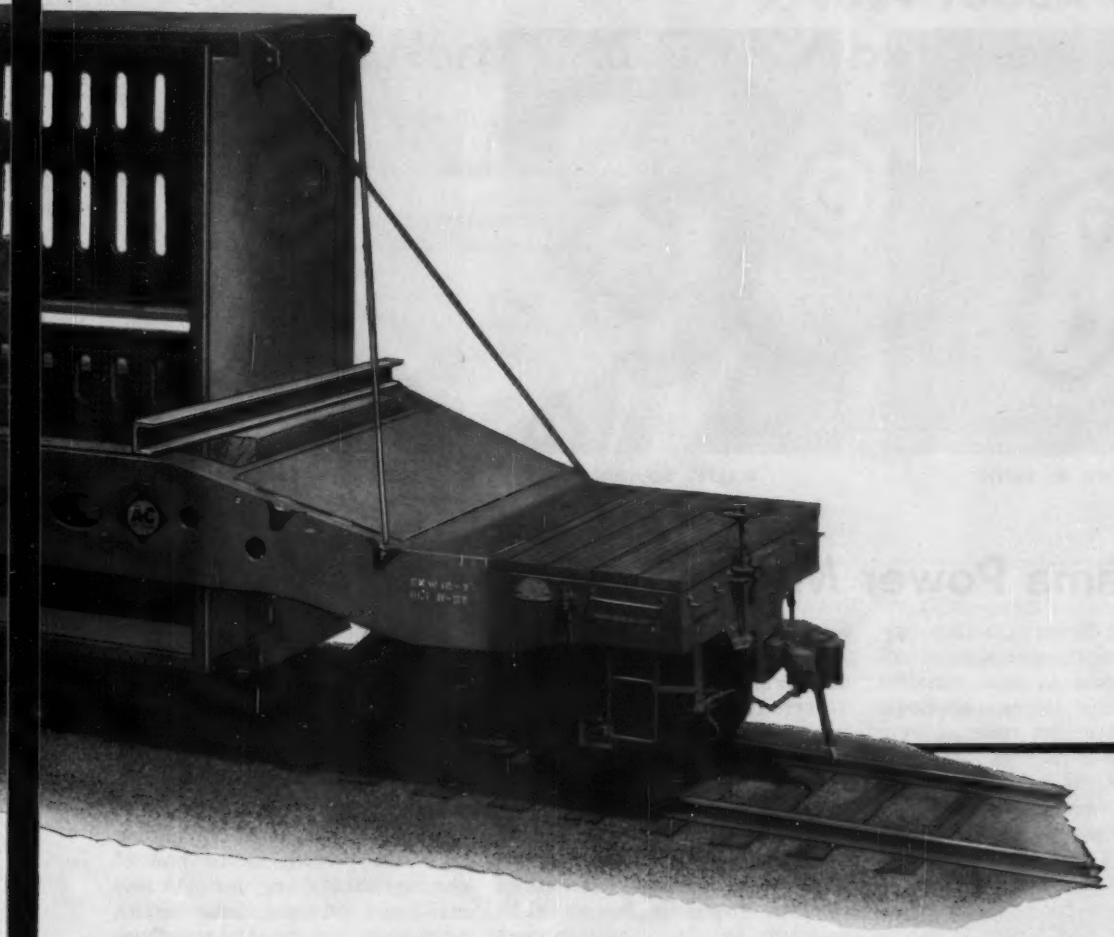

# Now in Service!

## New well-center cars reduce condenser erection time and costs

*For details, call your nearby A-C representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin*

A-C ALLIS-CHALMERS

A-5453



These new Allis-Chalmers cars, specially built to A-C design, carry loads of greater dimension than any conventional car can handle . . . permit shipment of larger shell sections, cut erection time at the job-site.

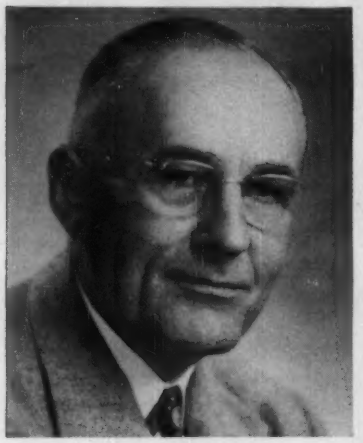
With an overall width of 12 feet 7 inches, these cars take shell sections up to 30 feet long, 10 feet wide, 18 feet high. Cars used previously could take sections only 7½ feet wide.

This solution to the problem of transporting continually larger condensers to ever larger power plants is an example of the attention given to *all* the problems involved in building condensers — research, engineering, manufacturing, shipping, erecting, servicing. When you specify Allis-Chalmers you get complete engineering for optimum efficiency.

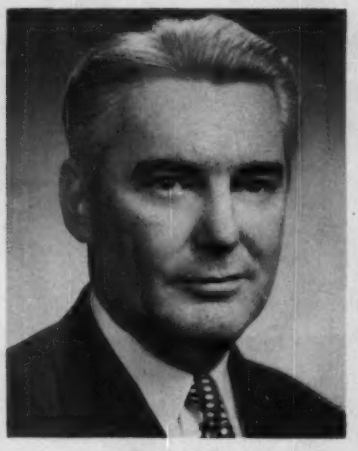
### Matched Auxiliaries

Whatever your requirements may be in size or shape, Allis-Chalmers can supply surface condensers and all necessary auxiliaries — circulating pumps, condensate pumps, motors, air ejectors, controls, valves — all engineered by Allis-Chalmers.

# ALLIS-CHALMERS



LEWIS M. SMITH



WALTER BOULDIN

E. C. EASTER

# Alabama Power Makes Executive Changes

Alabama Power Co has announced the recent election of Walter Bouldin as new president of the company. He succeeds Lewis M. Smith, who has resigned from that position to become vice chairman of the board. In addition, E. C. Easter was made executive vice president of the Birmingham utility company.

Bouldin, before being elected unanimously to his present position as president, had served as executive vice president of the company since 1955. His long experience in the legal and financial affairs of the utility began soon after his graduation from Harvard University Law School in 1928. At that time he became associated with the law firm of Martin, Thompson, Foster & Turner. He remained with them and successor firms until 1952, when he left to join Alabama Power as financial vice president. Bouldin is also a graduate of the University of Alabama, where he earned his A.B. degree in 1925.

Smith, a 34-year veteran of Alabama Power Co, has served as president of the company since August of 1952. Since joining the utility in 1923, he has served in various executive capacities including chief electrical engineer, director of public relations, and vice president and general manager. Smith is a graduate of the college of engineering of the University of Alabama.

Easter, now executive vice president, has served as vice president in charge of sales for the past eight years. He has been affiliated with Alabama Power since 1927, when he was appointed to the post of chief agricultural engineer. For several years previous, following his graduation from the Alabama Polytechnic Institute, he had been engaged in studies looking to better economic conditions on Alabama farms through the various applications of electricity.

JACK S. PARKER

# GE Names Parker to VP Post

General Electric Co has named Jack S. Parker to succeed Lemuel R. Boulware as vice president-public and employee relations. Boulware, who is within three years of retirement, will be consultant to Parker and continue as vice president and member of GE's executive office.

Parker has been vice president-general manager of the Aircraft Gas Turbine Division since last December. A 1939 mechanical engineering graduate of Stanford University, Parker has been with GE since 1950. He first served as manager of the Separations Division and later as assistant manager of design and construction at Hanford Atomic Works. He rose to operation manager, aircraft nuclear propulsion project in 1952 and general manager, small aircraft engine department the next year. In 1955 he was named general manager of the Aircraft Gas Turbine Division.

# Clarke and Northup Advanced by Crouse-Hinds

Recently promoted by Crouse-Hinds Co were Albert H. Clarke, to vice president for manufacturing, and Russell P. Northup, to vice president for engineering.

Clarke, former vice president-engineering, will now direct and coordinate all manufacturing, industrial engineering, employee relations, production planning, and procurement for the company.

Northup, who has been commercial vice president for Condulet sales, will now supervise the company's product research and development programs.

In other promotions, John B. Crosby was named to succeed Northup as Condulet sales manager and William A. McAuley was appointed new products manager in the Sales Division.

ALBERT H. CLARKE RUSSELL P. NORTHUP

## PERSONAL BRIEFS

**Francis J. Labanca** is new assistant to Vice President **Gerald L. Andrus** of New Orleans Public Service, Inc.

**Thomas E. Black** will assume new responsibilities as manager of the Benton County Public Utility District on Oct. 1.

Jersey Central Power & Light Co has named **George H. Ritter** superintendent of the E. H. Werner generating station and **George Kelcec** operation engineer in the production department.

**Clyde H. Spencer** has joined Sacramento Municipal Utility District as project engineer of its $85-million Upper American River power and water project. His job as director of the Bureau of Reclamation's Sacramento Region II has been assumed by **Bernard P. Bellport.**

American & Foreign Power Co Pres **Henry B. Sargent** has been named by the International Trade Mart to receive the 1956 Thomas F. Cunningham Award.

**Alex Rogers,** controller and secretary of Mississippi Power & Light Co, has been elected to membership in Controllers Institute of America.

New Brunswick Electric Power Commission has named **R. E. Tweeddale** to succeed retiring **J. L. Feeney** as chief engineer.

**John R. Kleespies** has been named to fill the new post of manager of the department on procedures and organization at Pacific Gas & Electric Co.

The new Metallurgical Society of the American Institute of Mining, Metallurgical, and Petroleum Engineers has elected **John C. Kinnear, Jr,** of Kennecott Copper Corp, as president; **Arthur W. Thornton** of U. S. Steel Corp as past-president; and **Walter R. Hibbard, Jr,** of General Electric Co as vice president.

**Charles A. Keller** has been appointed director of the production Division of Atomic Energy Commission's Oak Ridge operations. He replaces **Ray C. Armstrong,** now assistant manager of operations.

New officers of Illuminating Engineering Society are **Kirk M. Reid,** of General Electric Co, president; **Joe B. Browder,** Georgia Power Co, vice president; **James R. Chambers,** Appleton Electric Co, treasurer; **J. Dixon Mitchell,** Westinghouse Electric Corp, director; and **J. D. Whitnell,** Arizona Public Service Co, director. Regional vice presidents are **James A. Banton,** Tampa Electric Co; **A. E. Fleming,** GE; **Reuben K. Lothrop,** Southwestern Gas & Electric Co; **Charles C. Shotwell,** Philadelphia Electric Co; and **J. C. Wilson,** J. A. Wilson Lighting & Display, Ltd.

**W. G. Reynolds** was recently named president of Reynolds International, Inc, a subsidiary of Reynolds Metals Co. He continues as vice president of the parent firm.

The Delta-Star Electric Division of H. K. Porter Co has named **Frank Mason** manager of Thomas Works. He assumes the duties formerly held by **Frank Soles,** who returns to the Chicago Works.

Dodge Manufacturing Corp has designated **Carl K. Shank** works manager; **Edwin Rhodes** purchasing agent, **Richard Kaiser** plant engineer, and **Paul Jordan** director of engineering.

## OBITUARY

**J. William Bennett,** 59, vice president in charge of engineering at Western Massachusetts Electric Co since early this year, died suddenly at Springfield, Mass., while attending a staff meeting.

**Raymond B. Elmendorf,** 51, manager of marketing for General Electric Co's conduit products department, died suddenly at his Stratford, Conn., home.

**Frank R. Jamison,** 81, retired director of advertising and public relations for Public Service Co of Colorado, died recently following a long illness.

# Volseal...

## the new high dielectric putty...

## makes sealing easier!

New Johns-Manville Volseal is a high dielectric putty designed for sealing heavy cables and irregularly shaped objects. It has a dielectric of 445 vpm, together with excellent physical properties. Resists acids and alkalis, weathers well, is highly resistant to water, does not corrode metals.

Volseal also offers easy application. It is highly elastic, provides good adhesion, hardens within 3 hours on air curing. Available in extruded beads, ribbons and pugs. For complete details on Volseal and its new companion product Napseal, the petroleum resistant sealing compound, write Johns-Manville, Box 14, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

JM

**Johns-Manville**
**SEALING COMPOUNDS**


## SALES ASSIGNMENTS

### COMPANY STAFFS

**Clark Controller Co's** new district sales office in San Mateo, Calif., is headed by David J. Belock. The office will serve the San Francisco area.

**Cochrane Corp** has elected Joseph R. Denton as vice president of New York district sales. He is former manager of Cochrane's New York district sales office.

**Federal Pacific Electric Co** has appointed B. S. Burke as manager of its Great Lakes sales region, which is composed of the states of Michigan, Ohio, West Virginia, southern Indiana, Kentucky, western Pennsylvania, and western New York.

**Foster Wheeler Corp** has designated S. P. Trewin as district sales manager with headquarters in the company's new office in Seattle, Wash. He will supervise sales in Idaho, Montana, Oregon, and Washington.

**Gould-National Batteries, Inc,** has named K. A. Vaughan as Northeastern regional manager for its industrial division. Vaughan, who is also export manager, will supervise sales and service activities in Maine, Vermont, New Hampshire, Rhode Island, Connecticut, and parts of New York and New Jersey.

**Hubbard & Co** has announced the following appointments in the Northwestern Division sales organization: William Calog was named division sales manager; Edward W. Fitzgerald, district sales manager in Illinois and Wisconsin; Roy Peterson, product manager of lightning arresters and cutouts; Herbert C. Lansdell, sales administrator of the new midwestern region; and J. C. Carroll, general sales manager, midwestern region.

**International Business Machines Corp's** R. S. Wiggins was recently named a special representative in the public utilities and petroleum department of the eastern sales region.

**Maryland Shipbuilding & Drydock Co** has added Thomas W. Crocker to the sales staff of the Industrial Products Division.

**McGraw-Edison Co's** Pennsylvania Transformer Division has appointed Roger J. Schumacher to head the new Buffalo branch office. The new facility, which will handle sales activities in western New York, will function as a branch of the company's Syracuse district office.

**Standard Transformer Co** has appointed Curtis W. Lehner as sales representative in Georgia and eastern Tennessee.

**Triangle Conduit & Cable Co, Inc,** has named Robert E. Wallace San Francisco district manager. He will cover the northern California territory.


*Over 100 specialists bring you . . .*

## The most needed data IN ALL FIELDS OF Electrical Engineering

**JUST OUT!** The revised ninth edition of a book that leaders in the field have looked to for years as the authoritative reference serving their every need. Here is an encyclopedia of facts, figures, definitions, conversion factors, principles, accepted formulas, experimental data, etc. The most frequently used theories are covered just as thoroughly as recent developments and practices in every major area of electrical engineering.

REVISED 9th EDITION

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- over 600 tables
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- 26 big sections

## STANDARD HANDBOOK for ELECTRICAL ENGINEERS

This revised Ninth Edition takes into account the rapid strides made in the field during the past few years. Nuclear power, telemetering, transistors, electrical measurements of non-electrical quantities — these and many other topics now make this book a complete guide to the many newly opened areas of electrical engineering.

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**Westinghouse Electric Corp** has named Arthur G. Kane, Jr, and Carl W. Waldow as apparatus area sales managers with offices at the Los Angeles district headquarters . . . New manager of major accounts for the major appliance division is J. F. O'Donnell. He replaces W. B. Creech, now manager of the new service division . . . L. M. Walker was recently appointed sales manager of the firm's manufacturing and repair plant in Houston, Tex . . . The South Pacific district has named Charles E. Hammond as assistant manager, with responsibility for coordinating the efforts of various Westinghouse offices being established throughout metropolitan Los Angeles.

**Westinghouse** has appointed Charles C. Smith, Jr, as new area sales manager of the Atlanta sales office He replaces H. H. Gray, now assistant to the manager of industrial sales in the East Pittsburgh plant . . . The miniature lamp department has as its new marketing manager Frank Ogden.

**Worthington Corp** has advanced William C. Check to Midwest region sales manager of its marketing division.

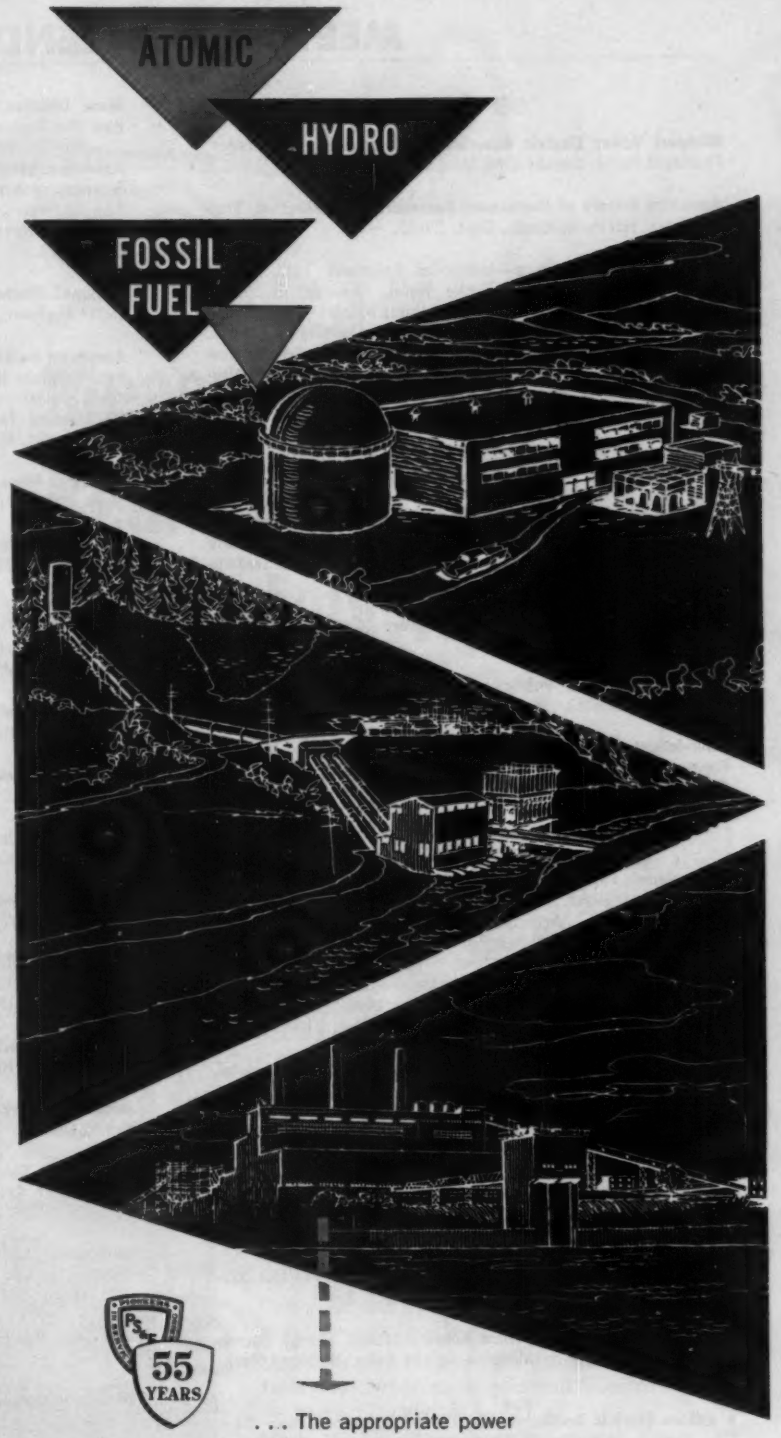
#### REPRESENTATIVES

**Automatic Switch Co** has appointed Air & Hydraulic Equipment Co as authorized stocking distributors of Asco solenoid valves in the Hackensack, N. J. area.

**Brown Boveri Corp's** Midwest representative. Hooper-Green Co of Chicago, has appointed William Hatch, Jr, as a sales engineer.

**Cornell-Dubilier Electric Corp** recently named Abbett & Hustis as representative in the New England territory.

**Highway Trailer Co's** new distributor in Tennessee, Mississippi, Alabama, and parts of Arkansas is Utilities Equipment Co, Inc.



# MEETINGS CALENDAR

## SEPTEMBER

**Missouri Valley Electric Association**—Accounting Conference, President Hotel, Kansas City, Mo., Sept. 23-24.

**American Society of Mechanical Engineers**—Fall Meeting, Statler Hotel, Hartford, Conn., Sept. 23-25.

**Edison Electric Institute**—Industrial Relations 10th Annual Round Table Conference, Drake Hotel, Chicago, Ill., Sept. 23-25; Meter & Service Committee, Hotel Nicolet, Minneapolis, Minn., Sept. 23-25; Commercial Cooking, Lighting & Electric Space Heating Committees, New York City, Sept. 26-27; New England Dealer Workshop, Wianno, Mass., Sept. 26-27; Electrical Systems & Equipment Committee, Cosmopolitan Hotel, Denver, Colo., Sept. 30-Oct. 1.

• **Standards Engineers Society**—6th Annual Meeting, Hotel Commodore, New York City, Sept. 23-25.

**American Institute of Electrical Engineers**—Sixth Annual Industrial Electronics Symposium, co-sponsored with Institute of Radio Engineers, Morrison Hotel, Chicago, Illinois, September 24-25.

**Electric Companies Advertising Program**—Copy Group Meeting, Detroit, Mich., Sept. 25.

**Electric Companies Public Information Program**—Workshop Conference, Whittier Hotel, Detroit, Mich., Sept. 25-27.

**Inter-Industry Farm Electric Utilization Council**—National Power Workshop, Fourth Annual Meeting, Shirley-Savoy Hotel, Denver, Colo., Sept. 29-Oct. 1.

## OCTOBER

**Pennsylvania Electric Association**—50th Annual Meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., Oct 2-3; Communications Committees, Abraham Lincoln Hotel, Reading, Pa., Oct. 7-8; Meter Committee, Shenango Inn, Sharon, Pa., Oct. 10-11; Relay Committee, Abraham Lincoln Hotel, Reading, Pa., Oct. 17-18; Systems Operations Committee, Bedford Springs Hotel, Bedford, Pa., Oct. 24-25; Transmission & Distribution Committees, Lord Baltimore Hotel, Baltimore, Md., Oct. 31-Nov. 1.

**Indiana Electric Association**—French Lick-Sheraton Hotel, French Lick, Ind., Oct. 2-4.

**Missouri Valley Electric Association**—Sales & Rural Conference, (and Home Service Workshop), Lassen Hotel, Wichita, Kansas, Oct. 2-4.

**International Association of Electrical Leagues**—Annual Conference, Sheraton-Gibson Hotel, Cincinnati, Ohio, October 2-5.

• **Northwest Public Power Association, Inc**—Power Use Section Annual Meeting, Newport, Oregon, Oct. 3-4.

**National Industrial Conference Board**—Atomic Energy Course for Management, Hotel Moraine on the Lake, Highland Park, Ill., Oct. 6-12.

• **Edison Electric Institute**—LBE Press Conference, New York City, Oct. 7; Mid-Atlantic Home Service Workshop, Philadelphia, Pa., Oct. 7-8; Prime Movers Committee, Hotel New Yorker, New York City, Oct. 7-9; Home Service Committee, Philadelphia, Pa., Oct. 9; Commercial Division Executive Committee, New York, N. Y., Oct. 9-10; Area Development Workshop, Phoenix Hotel, Lexington, Ky., Oct. 9-11; Transmission & Distribution Committee, Statler Hotel, Boston, Massachusetts, October 17-18; Insurance Committee, Dearborn Inn, Dearborn, Mich., Oct. 17-18; Accounting Division Taxation Accounting Committee, held jointly with AGA, Williamsburg, Virginia, October 23-25.

**Iowa Utilities Association**—Management Conference, Hotel Fort Des Moines, Des Moines, Iowa, Oct. 7-8.

**American Society of Mechanical Engineers**—Lubrication Conference, sponsored jointly with American Society of Lubrication Engineers, Royal York Hotel, Toronto, Canada, Oct. 7-9; Power Conference, American Hotel, Allentown, Pennsylvania, Oct. 21-23.

**National Electronics Conference, Inc**—13th Annual Meeting, Hotel Sherman, Chicago, Ill., Oct. 7-9.

**American Institute of Electrical Engineers**—Fall General Meeting, Morrison Hotel, Chicago, Ill., Oct. 7-11; Computers in Control Symposium, Hotel Claridge, Atlantic City, N. J., Oct. 16-18; 3rd Annual Farm Electrification Conference, Hotel Nicollet, Minneapolis, Minn., Oct. 29-31.

**Electrical Association of Philadelphia**—15th Electrical Progress Show, Convention Hall, Philadelphia, Pa., Oct. 8-10.

**Canadian Electrical Manufacturers Association**—13th Annual Meeting, Sheraton-Brock Hotel, Niagara Falls, Ontario, Canada, Oct. 9-11.

**Southeastern Electric Exchange**—Accounting Section, Fort Sumter Hotel, Charleston, S. C., Oct. 10-11; Sales Section, Tutwiler Hotel, Birmingham, Ala., Oct. 16-18.

**Rocky Mountain Electric League**—54th Annual Convention, Broadmoor Hotel, Colorado Springs, Colo., Oct. 13-17.

**Interstate Power Club**—Hotel Martinique, New York City, N. Y., Oct. 14.

• **Pennsylvania State University**—Electric Utility Company Managers Seminar, State College, Pa., Oct. 14-16.

• **American Society of Civil Engineers**—Annual Meeting, Hotel Statler, New York City, Oct. 14-18.

**Wisconsin Utilities Association**—Electric & Gas Sales and Operating Sections Convention, Schroeder Hotel, Milwaukee, Wis., Oct. 16-18.

• **National Society of Professional Engineers**—Fall Meeting, Grand Pacific Hotel, Bismarck, North Dakota, Oct. 17-19.

**National Safety Congress**—Conrad Hilton Hotel, Chicago, Ill., Oct. 21-25.

•**Engineers Council for Professional Development and Engineers Joint Council**—General Assembly, Statler Hotel, New York City, Oct. 24-25.

**Oklahoma Utilities Association**—Electric Light and Power Division, Woodward, Okla., Oct. 25; Eastern District, Bartlesville, Okla., Oct. 25.

**American Power Dispatchers Association, Inc**—Fall National Meeting, Fresno, California, Oct. 25-26.

**Atomic Industrial Forum**—Annual Conference, New York City, Oct. 28-30.

**American Nuclear Society**—Winter Meeting, New York City, Oct. 28-30.

• **The University of Texas**—10th Annual Power Distribution Conference, Austin, Texas, Oct. 28-30.

**National Association of Railroad Utilities Commissioners**—Annual Conference, Peabody Hotel, Memphis, Tenn., Oct. 28-31.

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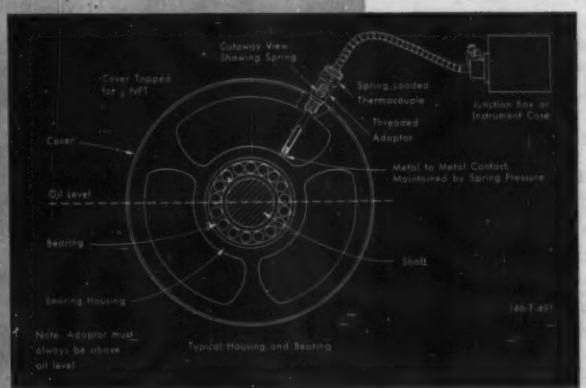


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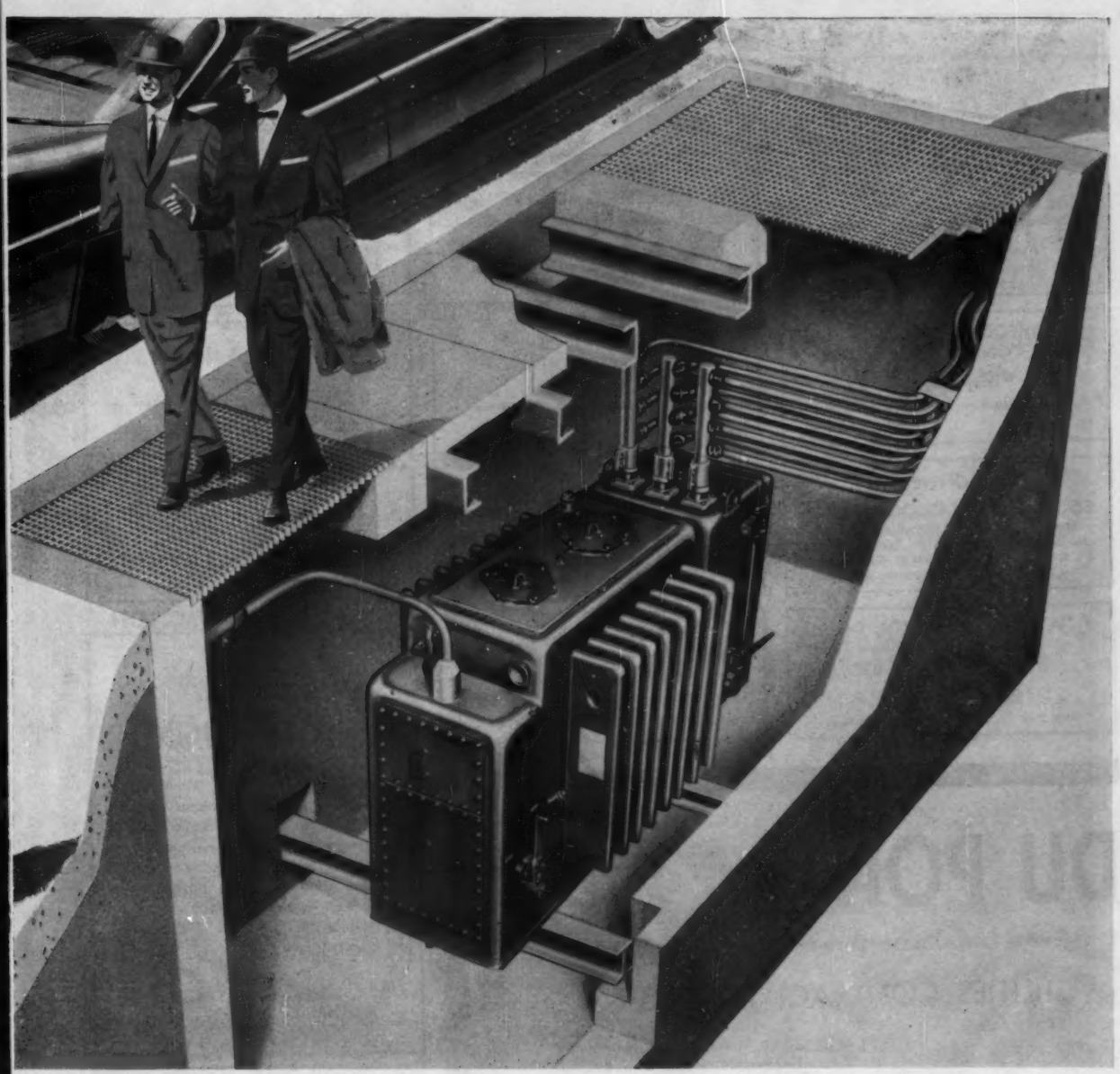

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# Advertising in This Issue


Air Preheater Corp. ..... 50
Allen-Bradley Co. .....123, 124
Allis-Chalmers Mfg. Co. ..4th Cover 8, 9, 19, 20, 128, 129
Anaconda Wire & Cable Co.... 49
Austin-Western Works ..... 53

Bakelite Co., Div. Union Carbide Corp. ..... 18
Blackburn Corp., Jasper ..... 52
Blaw-Knox Co., Power Piping & Sprinkler Div. ..... 45

Coates Field Service, Inc..... 133

Delta-Star Electric Division, H. K. Porter Company, Inc. ..... 103
Directory of Engineers ..... 138
du Pont de Nemours & Co., (Inc.) Polychemicals Dept. .....10, 11

Ebasco Services, Inc. ..... 32
Elliott Company .....112, 113
Engineers, Directory of..... 138
Enjay Company, Inc. ..... 99

G & W Electric Specialty Co..... 127
General Electric Co. Apparatus Dept. ....2nd Cover, 89 90, 92, 93, 95
Graybar Electric Co., Inc..... 7
Grinnell Company, Inc. ..... 6

I-T-E Circuit Breaker Co., Switchgear Div. ..... 60
Indiana Steel & Wire Co., Inc..... 102
International Business Machines.. 140

Johns-Manville ..... 132
Joslyn Mfg. & Supply Co..... 97

KPF Electric Co. ..... 51
Kearney Corp., James R.....116, 117
Kuhlman Electric Co. .....12, 13

Lapp Insulator Co., Inc..... 54
Line Material Industries ..25, 26, 27 28, 29

McCabe-Powers Auto Body Co.. 47
McGraw-Hill Book Co., Inc..... 132

Minneapolis-Honeywell Regulator Co., Industrial Div. ..... 135
Moloney Electric Co.....3rd Cover

National Electric Products ...30, 31

Ohio Brass Co. .....58, 59, 104, 105
Okonite Co., The ..... 4

Pennsylvania Transformer Div., McGraw-Edison Co. .....16, 17
Pioneer Service & Engineering Co. 133
Preformed Line Products Co..... 15

RT&E Corp. ..... 48

S&C Electric Co.....61, 62, 63, 64
Sangamo Electric Co..... 14
Searchlight Section .....138, 139
Southern States Equipment Corp.. 55
Standard Transformer Co..... 118
States Company ..... 114

Union Carbide Corp., Bakelite Co. Div. ..... 18

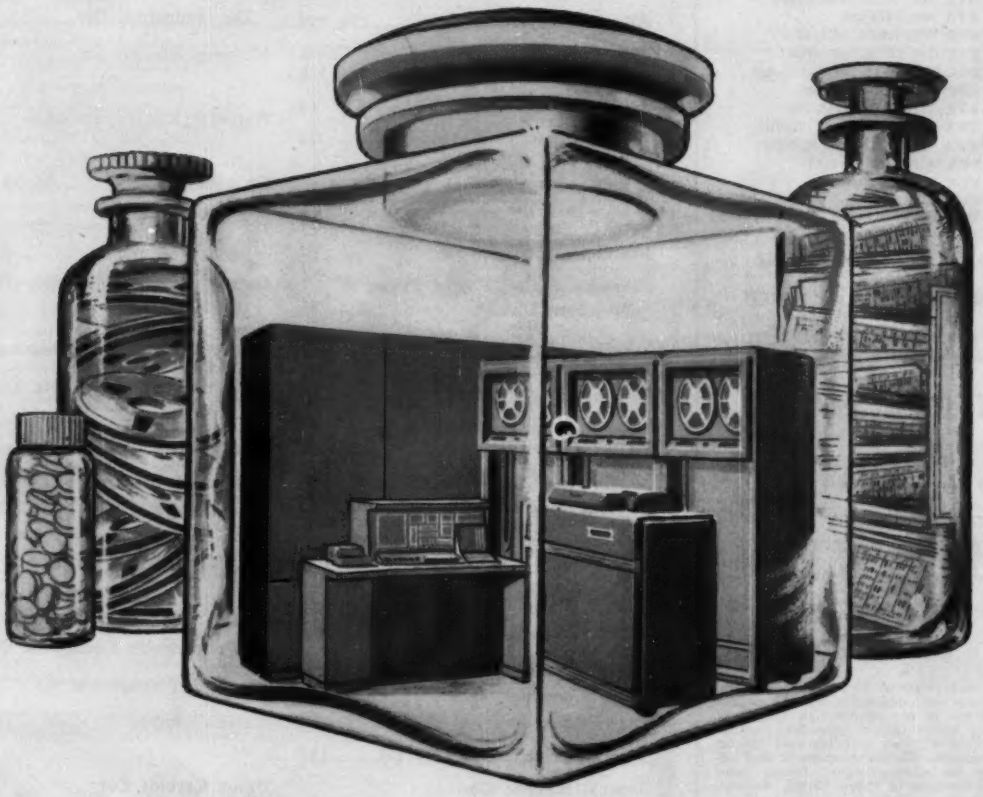
Wagner Electric Corp..... 46
Westinghouse Electric Corp...33, 34 35, 36, 37, 38, 39, 40, 41, 42, 43, 44 56, 57, 100, 101, 107, 108, 109, 110 136, 137
Westinghouse Electric Corp., Lamp Div. ..... 115

PROFESSIONAL SERVICES ..... 138

CLASSIFIED ADVERTISING
F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES..138, 139
EQUIPMENT (Used or Surplus New) For Sale .....138, 139

# CURE...



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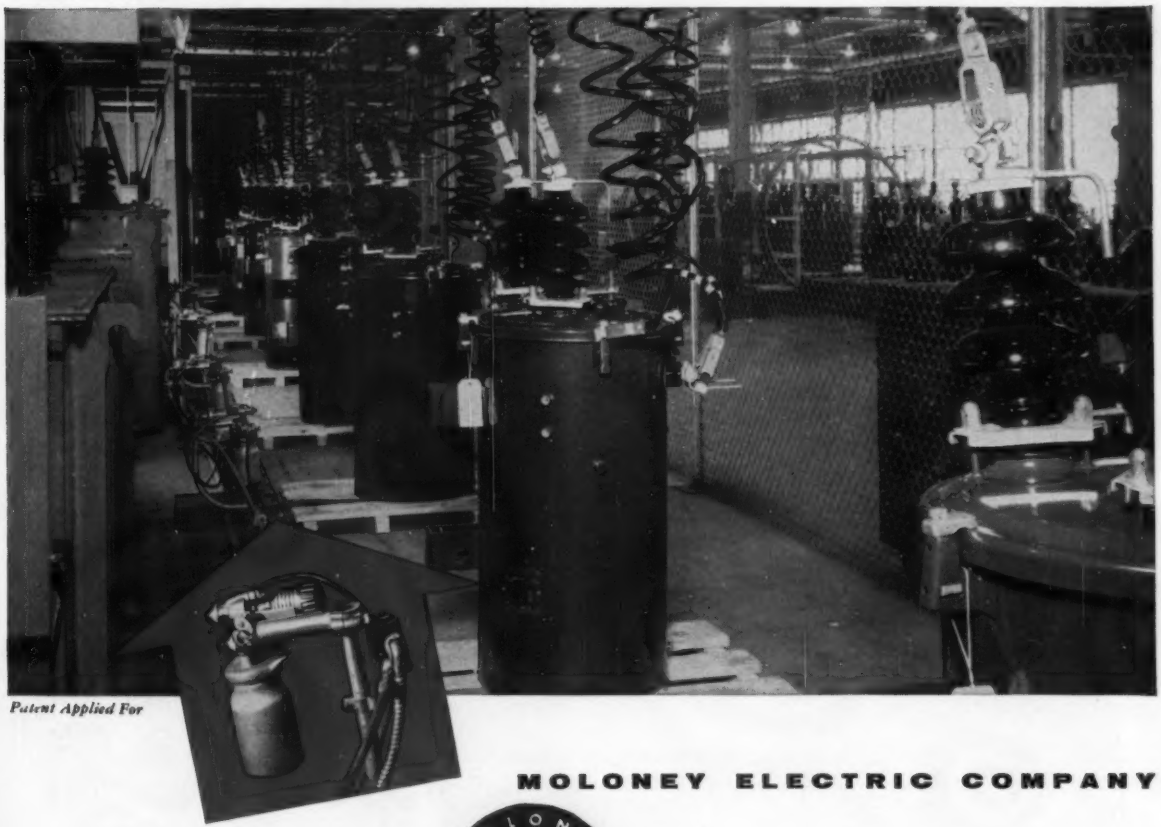

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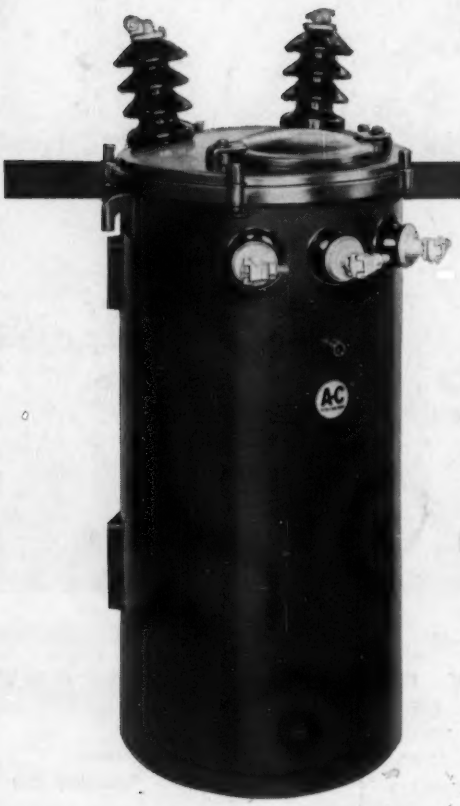

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